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HONORARY AND CORRESPONDING MEMBER OF THE MEDICAL SOCIETIES OF FLORENCE,
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TO

THE RIGHT HONOURABLE

WILLIAM CAVENDISH, LL.D. F.R.S.

EARL OF BURLINGTON;

GRADUATE, WITH THE HIGHEST HONOURS,

OF THE UNIVERSITY OF CAMBRIDGE;

CHANCELLOR OF THE UNIVERSITY OF LONDON;

ETC. ETC. ETC.

This Volume is Dedicated

IN TESTIMONY OF THE HIGH RESPECT OF

THE AUTHOR.

Tu, qui natales antiquo sanguine claros
Ingenii decoras nobilitate novâ,
Accipe non magnâ turgentem mole libellum,
Et mea mansuetè quantulacunque lege.
Publicus his postquam favor adfuit, acriùs audens
Spem de se tandem cœpit habere liber;
Nec satis esse putat: si Tu dignabere laude,
Hoc saltem titulo tutior esse cupit.

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TO

THE FIFTH EDITION.

An author, who has retouched three or four editions of a scientific book, can fully sympathize with the "ἐποίει" of the ancient artist, when he at last sent forth the work which he had laboured to finish "*ad unguem.*"

I have not, therefore, on account of the praise bestowed on the last edition,* slackened my endeavours to render the present still more worthy of the patronage of my profession.

---

* "This classical work may have been 'revised,' but it could hardly be 'improved.'"—*Medico-Chirurgical Review.*

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TO

THE THIRD EDITION.

THOUGH it may be thought that the third edition of a book requires no advertisement, I consider it quite necessary to explain some circumstances connected with this work. Feeling that no author has been more indebted to the indulgence of the public press for kind criticism, I have endeavoured to profit by the hints given me in every respect but one. The first edition was sent forth to take its chance in the world without herald of preface or advertisement, unadorned by dedication, and unaccompanied by any table of contents: my original reasons for the last omission remain unshaken; and I have therefore merely given, for the convenience of students, a few pages so prepared that they may make an index for their own use, by putting down, as they go through the work, the position in which subjects occur in different parts of it; as I have done with respect to "arterial action," "ulceration," &c. &c.*

I found that the former editions were more pleasing to fully educated medical men and men of experience than to the tyro. This was not my original intention; and I have therefore taken pains to render the work more intelligible and useful to the latter, and have added much to suit the taste of both.

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* I have now, however, (5th edition, 1849) in deference to the wishes of others added an Index.

It does not appear to me that I used too strong an expression formerly in speaking of the confusion which has existed in medicine; and, as an example, I need only refer to the striking fact noticed in this work, that the two words, *inflammation* and *irritation*, which are most frequently in the mouths of medical men, are up to this day perpetually used in a double or equivocal sense. Inflammation is correctly used to imply disease, and incorrectly to signify the process by which the damage done by the disease is repaired (pp. 58-60). Irritation is perpetually incorrectly used to signify a state of disease, as it can only be correctly applied to the process whereby any thing irritates, annoys, or over-excites a part: the irritant, irritating thing, whatever that be, by its operation (irritation) produces in the part morbid sensibility. One great objection to using the term irritation to imply disease is, that irritation (the act of irritating) produces sometimes inflammation, and sometimes only morbid sensibility; but, according to the old phraseology, *irritation* produces *irritation* and inflammation produces sympathetic irritation and constitutional irritation, and sympathetic irritation and constitutional irritation arise from local irritation, &c. &c. In order to avoid this equivoque, I determined, in the present edition, to adopt the term *morbid sensibility* as the name for the diseased state usually implied by irritation, and to use the word irritation only in its proper sense; and wherever the word irritation occurs in other works implying disease, it will be found that mordid sensibility may be substituted for it.

In this alteration of a term, I consider that I have done the student good service, rendering my own explanations more clear, and also those of other writers, by giving him an elucidation of the word irritation where it occurs as a disease in the valuable works of such authors as Sir A. Cooper, Travers, &c., and enabling him at a glance to distinguish whether it be mentioned as a cause or a symptom.

Many of the valuable works of Orfila, Christison, and others, on toxicology, will be more intelligible by referring to the state of morbid sensibility explained in the following pages.

Again, I have shewn (pp. 73-74) that there is in reality no such thing as a specific; and, on the other hand, I have explained how some medicines become useful in such a variety of diseases as almost to realise the dreams of the ancients and alchymists respecting a *πανάκεια*, or an *elixir vitæ;* and thus why one empirical remedy, antimony, held the reins of the "currus triumphalis" until superseded by the more modern blue-pill.* I may mention a few more of the explanations given. I have shewn that tonics are not stimulants; and why they may be combined advantageously with sedatives, with stimulants, or with narcotics; how stimulants are tonic; how sedatives are tonic; how narcotics are tonic; and, though not a homœopathist, how emetics stop vomiting, and purgatives diarrhœa. I have shewn how every medical man has his hobby to carry him to the same point, which, though he thinks it very different from his neighbour's, is as like it as one four-legged jade is to another; how one man thinks he has made a discovery that he can cure cholera with sugar of lead, and that there is nothing equal to it; whilst tartar-emetic, calomel, Epsom salts, or Glauber salts, or common salt, or mustard, or lemonade, or vinegar and water, &c. &c., will do the same thing; though none of them more quickly carry off the vomiting and purging than two of these hobbies in double harness—tartar-emetic with some neutral salt, I care little which.

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* I have given my opinions respecting the pathology of the nervous system, as depending on physiology, in the course of this work; but was unwilling at present to introduce a subject so much under dispute as "animal magnetism." The principle upon which it acts (and it undoubtedly does act to a certain extent) is, I think, easily explained. The physiology of the nerves shews, not merely in the torpedo, gymnotus electricus, &c., but in simple muscular action, &c., that a change in the electric state, plus or minus, takes place on every act of volition; in other words, that there is an electric communication between the brain and the tips of the fingers, whether in playing the pianoforte, or making the passes or actions of animal magnetism: and every one of these actions is a succession of weak electric shocks, not individually perceptible, but by continuation producing an impression or result; as an electric jar may be charged by a weak electric machine, though no sparks be visible. The person who makes the passes produces a succession of transmissions of electricity, which alters the electric state of the brain of the person magnetised, who is in a state of quiescence, and whose nervous system will be more susceptible if out of health or inclined to coma, independent of the very various degrees of susceptibility of the nervous system of persons even in health.

An anonymous writer once advanced against this work, that I differed from J. Hunter in the theory of inflammation,—as if he were "the law and the gospel." It may be seen that I differ not only from J. Hunter, but from his talented successors, Bichât, Sir A. Cooper, W. Lawrence, and others, in theory, on physiological and pathological principles, though little in therapeutics. On the subject of the division and classification of remedies, on the cause of the sounds of the heart, on the proximate cause of inflammation, on morbid sensibility, &c., I feel confident of obtaining the future suffrages of the profession. On the essential points of practice in the treatment of inflammation, I agree, of course, with men of such experience as Sir A. Cooper and Lawrence. It may be asked, then, what does it signify wherein we differ? It is, in my opinion, of great consequence to correct erroneous theories, and thereby enable students to arrive sooner at well-founded principles of practice.

Although this work consists rather of general pathology than what is called the practice of medicine, it will be found to contain the essentials of the treatment of disease. The greatest difficulties have arisen from the loose way in which remedies have been arranged and classified: I have endeavoured to remove these difficulties by the division into stimulants, sedatives, narcotics, and tonics; and by shewing how these are to be combined with each other, so as to afford a guide to clinical practice.

We sometimes find persons doubting the efficacy of valuable remedies from not knowing how to apply them; for instance, bark, sarsaprilla, dulcamara, logwood, carbonate of iron, arsenic, conium, digitalis, elaterium, hydrocyanic acid, and blisters; each of these has at one time or other been said to be either inert or injurious, from misapplication, though they are powerful and efficacious remedies. We every day meet with old men who from prejudice have scarcely ever used some one or other of these substances; though others, placed in an extensive field of practice, such as our hospitals, use them daily with advantage: there are even persons who have been thirty or forty years in tolerably extensive practice who have not made use of a lancet so many times.

In going round the wards of an hospital a pupil might remark to the physician at one bed, What a small dose! and at the very next, perhaps, What a large dose you have given! large and small being both incorrect terms when the force applied is properly adapted to the quantity of disease and state of constitution. In practice there should be no such thing as boldness or timidity; boldness is an ignorance (for we must not suppose a recklessness) of the harm which too strong means may do a fellow-creature; and timidity is an ignorance of the efficient means which remedies afford of relieving human suffering.

In this edition I have added many cases, in illustration of principles laid down, as they are equivalent to diagrams in geometry. A person who has studied geometry can understand the proof of a proposition in general terms without a diagram—but not so a beginner; and a beginner in medicine requires a reference to cases, to render some general principles intelligible.

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TO

THE SECOND EDITION.

I WAS originally led to publish this Treatise by a recollection of the difficulties I had met with in the study of my profession, and by the hope that I might aid in removing them from the path of others.

Upon commencing the study of medicine and surgery, after having become acquainted with the more precise physical sciences in the University, I was appalled to find it a complete chaos. Our family physician, really a man of great talent, and one of our professors, disheartened me by his answers. I inquired, "What is fever?"—Answer, of course, Cullen's definition. "But what produces it?"—"Sometimes one thing, sometimes another: excessive cold or heat, or the effluvia from a person who has fever." "But what is the cause of the phenomena in the body?"—"Spasmodic contraction of the extreme vessels." I could understand that cold might contract the extreme vessels, but I had been taught by the professor of chemistry that caloric expanded every thing. And, again, I did not see how effluvia produced spasm, nor how the spasm, even if it were produced, could make the skin extremely hot as well as cold. I was advised to read Cullen, and did so; but without finding the information I sought. Again I asked, "When you give a dose of rhubarb or castor oil to stop a diarrhœa of several days' standing, how does it effect this object?"—"By clearing away the peccant matter." "But would not the diarrhœa scour away this peccant matter itself?"—"Not so well." This did not satisfy me.

Neither could the surgeon clear up these points: "for his part, he did not pretend to understand physic." I "walked" the hospital at his elbow as dresser, and inquired, "Why do you apply a cold lotion to that inflammation?"—"To moderate the action of the vessels."—"Inflammation, then, is over-action of the vessels?"—

"Yes." "Why do you apply that *astringent* (goulard or nitrate of silver) to that other inflammation?"—"To diminish the action of the vessels." Now, the *action* of the vessels being *contraction*, my logic did not enable me to comprehend him; so, after asking why he put a cold lotion or poultice on one inflamed part, and a warm poultice or fomentation on another, and being told that I should find out by experience, I resolved on attempting to find out for myself.

I accordingly set seriously to work, and endeavoured to draw up a little code of general principles for my own use, as I could find nothing of the kind existing. The so-called systems of Cullen, Brown, Broussais, Rasori, &c., seemed mere individual opinions, totally differing from each other; and which was I to follow? Each of their originators appeared confident in himself, and despised his adversary; while their followers almost came to blows, arguing as much for victory as the love of truth. I visited the different schools: the students of each hinted, if they did not assert, that the other sects killed their patients; but I found that, provided the physician of each school was a man of talent and experience, the mortality was fairly balanced. I therefore concluded that, on investigation, some true general principles would be found to exist by which the apparent inconsistencies of correct practice might be reconciled, and the contest between such systems as were essentially at variance be decided. But, though innumerable volumes of cases, and interminable heaps of insulated precedents, were to be met with, no treatise upon first principles had appeared.

After twenty years of intense application to clinical practice, as student, assistant, and professor, I found the same acknowledged necessity for reducing the conflicting systems of medicine to general principles; and I therefore ventured to publish the result of my own labours, compressed into 130 pages.*

The subject of clinical lectures is closely connected with the attempt to reduce the science to general principles. In medical publications much just censure had been expressed of the neglect of clinical instruction, and of the omission on the part of hospital physicians and surgeons to render their experience available to the profession in general, and consequently to the public. In 1822 I had the honour to be elected Physician of the London Hospital,* at which time no clinical lectures were given in London: in the same year, however, I commenced this important branch of medical education, not merely instructing the pupils in the wards and theatre, but attending and explaining *post-mortem* examinations. This course I pursued at a great sacrifice of time and some of health, for six or seven years; when the rising members who had been my clinical secretaries,—Drs. Macbraire and W. J. Little (the latter now Professor of Comparative Anatomy, alumnus dignissimus of Müller and Grant), Messrs. Hamilton, Adams, Curling, &c.,—being able to relieve me, I continued only the lectures, instructions in the wards, and once a week an anatomical demonstration, illustrating cases by recently obtained specimens or by those in the extensive collection of pathological anatomy in the museum. In this mode I persevered up to the present session (1836), when, from being appointed to the University of London, it became impossible for me to continue it. I have of late years had the satisfaction of finding the example very generally followed in the metropolis, besides that of witnessing the success of the school in which it was first regularly established.

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* The trouble it cost in condensation makes me pleased whenever the term "little" is applied to the work; and I cannot deny myself the satisfaction of transcribing the words of Professor Stromeyer, of Hanover: "Dr. Billing's book is a very clever little *pathologia generalis;* his views certainly go beyond those of most pathologists, by his taking the nervous system into consideration. Upon the whole, I think it as much adapted for fully educated medical men as for students. Books like this are very rare; almost every writer strives, whatever few original ideas he has, to bury them in a mountain of generally known matter: whilst Dr. B. gives us a very intellectual (*geistreich*) view of his peculiarities." I must acknowledge also that I derived much satisfaction from the favourable notices of the medical reviewers, as their testimony gave me more confidence in the approbation expressed by private friends.

The medical officers of the London Hospital, I must also observe, were among the first who were mainly instrumental in *introducing* auscultation; and I am surprised that it is not yet by any means generally *adopted.* It is a source of real regret to me that so few medical men have taken the trouble, or known how, to avail themselves of this invaluable and indispensable method of detecting, so as to combat, the most deadly diseases of the chest. On this score Dr. T. Davies gained a well-earned celebrity; he not merely gave lectures to pupils, but collected the members of the profession at the east end of the town at his own house, and instructed them in this almost new sense of perception. From the time he became one of the medical officers of the London Hospital, in 1829, I derived great assistance from him in the clinical department, in the instruction of those young gentlemen who had the good sense to avail themselves of the opportunities afforded them of learning auscultation and the use of the stethoscope. One cannot be much surprised that the multitude are slow in adopting what in some instances has been treated with neglect, and in others has met with decided opposition, by men in high reputation and practice. As to the stethoscope, I wish it were understood that it is not absolutely necessary, except for motives of delicacy: as the apparent difficulty of using it deters some persons from commencing auscultation, and has given occasionally an opportunity for opponents to use a tremendous substitute for reasoning—ridicule! It is disagreeable to apply the ear to the chest, if the patient, as occurs sometimes in charitable institutions be not clean; and if the patient be a female, it is objectionable for other reasons: hence the artificial elongation of the meatus auditorius externus, called stethoscope, becomes eligible, though no better than the naked ear to judge by. I am in the habit of using a very simple one, which is merely Laennec's abridged, instead of being complicated, as it has been by other *improvers* of his instrument: it is rounded and cut away in the middle to make it light and convenient; the flat end being turned to the chest answers the purpose of the obturator; and it is only four inches long, which is sufficient for the purpose as to stethoscoper and stethoscoped.*

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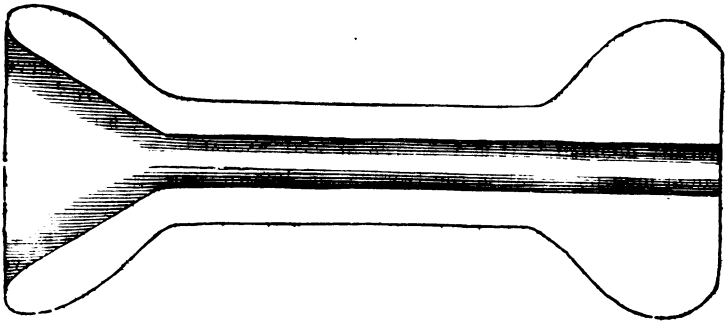
* The London Hospital, incorporated by royal charter in 1795, besides between nine and ten thousand cases per annum of diseases and injuries treated by the physicians and surgeons as out-patients, contains 320 beds, always filled with fit subjects of clinical study; the surgical accidents average 150 per week. Several foreign hospitals have twice and three times this number of beds; put they include persons disabled by old age, imbecility of mind, malformation, &c.—such as are taken care of in our workhouses and asylums of various denominations.



Section of the Stethoscope.

One great difficulty in the way of learners of auscultation is their attempting to begin on patients: this is like trying to study morbid anatomy before acquiring a knowledge of healthy structure. If beginners would first learn the sounds of respiration and of the heart in healthy persons, which may be done in about ten minutes once for all, they would have little difficulty in detecting any unhealthy deviation from the normal state, and would very soon arrive at just diagnosis. I warn medical men that they must soon turn their attention to the subject, or be disgraced. Many affectionate parents are in the habit of feeling the pulse and looking at the tongue of their children, when they suspect disease to exist; they will also ere long learn the very simple process of applying their ear to the chest, and thus put the medical attendant to shame, if he cannot resort to the same means.

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* I have the satisfaction of knowing that this simplified stethoscope is now generally employed, under various designations, and may be had of any surgical instrument-maker. (June 1849.)

But the progress of the schools has been slow enough; it is but now that comparative anatomy, which is the only sure foundation of physiology, is *beginning* to be taught in London; and it required the energy and talents of a Grant, with a firm footing in a great school, to carry it into effect, and to compel the other schools to follow the example. Professor Macartney, with all his energy and talents (and he does not need my testimony to establish his claims to both), fully imbued with its value, could not find support in his laudable attempt to establish it thirty years ago in Bartholomew Hospital; but I consider myself most fortunate in having early met with him and imbibed a taste for physiology. The ingenious and persevering German comparative anatomists with their microscopes are unravelling many a *dignus vindice nodus;* and I am gratified to find in their recent publications confirmations of opinions advanced in this work seven years since,—as, for instance, my explanation of the cause of a limb being "asleep," benumbed,* by reference to the medullary part of the nerves being in tubes (as asserted by Fontana), which has been demonstrated by Ehrenberg (Darstellung eines merkwürdigen Baues des Seelenorganes, Berlin, &c.); who has proved also that not only are there two sets of nerves (as referred to p. 110), those of animal and organic life, but that there is a third set, of the senses, all recognisable by their structure when an isolated piece of either is subjected to the microscope. Remak (Archiv für Anatomie, Physiologie, &c., von Dr. Johannes Müller, Jahrgang 1836, Heft 1 und 2) has likewise shewn the difference between the motor and sensitive roots of the symmetrical nerves—that the latter possess in addition some organic filaments, and that the glosso-pharyngeal belongs to the same order as the optic, auditory, and olfactory; thereby confirming Panizzi's opinion, that the hypoglossal is the motor, the lingual branch of the fifth the sensitive, and the glosso-pharyngeal the gustatory nerve of the tongue. Schwann (Müller's Handbuch der Physiologie, Coblentz, 1833), by experiment on the mesenteric arteries of small living animals, has demonstrated that I was right as to the *modus operandi* of cold as a remedial agent in inflammation. Schwann and Eulenberg, again, have shewn that the middle coat of the arteries is not muscular in structure, but elastic, as asserted by me (p. 31), consisting of that distinct tissue constituting the ligamentum nuchæ of ruminantia, the ligamentum flavum of man, &c.

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* See p. 82, this Edition.

The veterinarians also have contributed in their comparative department. Hausmann, by direct experiment, has added fresh proofs to my theory of inflammation (p. 39 et seq.); Sewell, of our own Veterinary College, twenty years ago published plates shewing the muscular coat in the bronchi of the horse; indeed, the muscularity of the bronchi was shewn by Morgagni: nevertheless, it has been lately spoken of as a discovery, as mentioned in Youat's valuable Journal, March 1837, in the Report of the Veterinary School of Alfort. Not that I agree that the muscularity of the bronchi can assist in natural expiration, for that is contrary to the physical structure of the chest—it merely helps to get rid of any noxious matter, whether generated there or introduced through the windpipe.

Before concluding this Preface, I wish to take the opportunity of adverting to one or two matters which will be found in the work. At p. 32, to the note originally published on the heart, I have added, that the sounds depend on, or are produced by, the valves. I would not burden the text with proofs of what I feel assured will shortly be generally received as a fact as well ascertained as the circulation of the blood. But as it is still disputed, not merely by individuals, but by Associations, and committees appointed by them to investigate the subject, I will here repeat my arguments already published, which have not, to the best of my judgment, been answered; and besides, by referring to their own experiments, I think I can disprove their assertions. In an Essay read at the anniversary meeting of the Hunterian Society (Feb. 9, 1832, and reported in the "Lancet," May 19, 1832), I first stated publicly "that the push or beat felt at the side is caused by the ventricular muscles in their systole to expel the blood. The first sound is caused by the tension produced in the shutting of the auriculo-ventricular valves, and the second sound is caused by the tension produced in the shutting of the ventriculo-arterial valves," &c. &c. "This is a simple unsophisticated explanation of the causes of the beat and sounds of the heart; and you will find that the morbid signs are all explicable as alterations of these." Some exemplification follows, unnecessary to repeat here. Subsequently Rouanet brought forward the same explanation in his thesis, which was noticed in the "Journal Hebdomadaire" (Sept. 1832), and copied into the "Medico-Chirurgical Review" (April, 1833), as well as an extract from my Essay; in which I had advanced, as I thought, sufficient to enable any practised physiologist to confirm my positions by the suggestions of his own mind. Finding, however, from some observations, that this did not appear to be the case, I published the following additional remarks in the "Lancet" (Nov. 30, 1833): "The succession of phenomena of the heart's action is as follows: first, the auricle contracts, then the ventricle; by the action of which latter the auriculo-ventricular valves are shut by the pressure of the blood against them. Upon the relaxation of the ventricle, the semilunar valves are shut by the backward pressure of the blood in the artery. The first sound takes place exactly synchronous with the impulsion and action of the ventricle; hence it might be supposed that the action of the muscle (as averred by some) produces the first sound. But the second sound takes place at a time when there is no action of the heart going forward; and this is peculiarly evident when there is an intermitting pulse, as there is then a marked pause after the second sound; so that, in fact, there is nothing but the semilunar valves in operation to produce sound at the instant."

I have thus proved that the second sound can be produced by nothing but the valves; and I have therefore shewn the tension of the valves to be a sufficient cause for the first sound; and as *nil frustrà natura facit*, according to the laws of reason in physics, more causes than are true or sufficient are not to be assigned (Newt. *Princip.* lib. iii. reg. phil. 1), so I discard muscular action as the cause of the first sound. These are my proofs, published between February 1832 and November 1833.

Now, as to their experimentum crucis (to shew that muscle produced the first sound), of putting the finger into the heart after the valves were destroyed, and their hearing a sound proceeding from the contraction of the heart, with air, carneæ columnæ, and bloody moisture in it, without the fingers: doubtless there was *a* sound produced independent of the valves, but not *the* sound of the heart. I say, my proof is legitimate—their assertion a sophism of *non causa pro causâ*. It is the tympanic sound of the membranous valves which, with the time of the beats, produces the rhythm; and we judge of the existence of certain states of disease by the degree and manner in which they are out of tune. Looking at the subject physiologically and pathologically, valvular sound is the one we have to depend upon; for granting, for argument's sake even, that any other exists as a normal accompaniment, it has no more to do with *the* sound, than the drone of a bagpipe has to do with the tune. In his last appendix, Dr. Hope began to allow that the first sound may be "possibly partly valvular," but still adheres to the "bruit musculaire."

According to the report of the London Committee of the British Association, the subject seemed to be in the position agreeing with the vulgar notion of a "suit in Chancery" ("Med. Gaz.," Dec. 10, 1836).

With respect to the assertion of a celebrated experimenting physiologist, that the sound is produced by the heart coming pit-a-pat against the parietes of the chest, it is only necessary to refer to Mr. Bryan's beautifully ingenious experiment ("Lancet," Feb. 8, 1834;

also Dec. 26, 1835, and Feb. 27, 1836); by which he proved that the heart never quits the anterior wall of the chest, but remains in apposition during both systole and diastole.

In giving the above explanation to my class, I was in the habit of exemplifying how the sound was produced, by a strip of paper two or three inches long, and half an inch wide, suddenly stretched—the sound of which was heard all over the theatre. Dr. Hope subsequently mentioned, in his Appendix, 1835, his having employed a piece of tape for a similar purpose, thus illustrating what he had previously denied to exist.

* * * * * * * *

Mr. Bryan published the same theory ("Lancet," Jan. 1833; but when he became acquainted with my priority, he very candidly wrote an acknowledgment, in a critique on the Report of the Dublin Committee of the British Association ("Lancet," Dec. 26, 1835, and Feb. 27, 1836).

* * * * * * * *

In our science, from insufficiency of data, and being often obliged to found our arguments on analogies, it is difficult to avoid falling into errors of *non causa*, and reasoning in a circle. I therefore claim indulgence, and entreat some of my highly gifted brethren to improve on my suggestions.

The following additional matter on the causes of the sounds of the heart was published by me in the "Medical Gazette," April, 1840.

* * * * * My object is to prove that the physiological sounds of the heart are caused by the valves, and the valves only. The question is still *sub judice;* at least, I have met with no public acknowledgment of the truth of my proposition, published in 1832, that the normal sounds of the heart are produced by, and depend upon, the tension of the valves.

The moment I read Laennec's assertion, that the second sound was caused by the auricles, I perceived that it was erroneous, as being inconsistent with the successive actions of the heart, acknowledged by physiologists from the time of Haller, and fully confirmed by experiments on animals,—viz. that the auricles contract first, then, following continuously without any interval, the ventricles; and that subsequently there is a period of relaxation, or cessation of action, in each part during the diastole* between each systole. I was thus satisfied (from the repose of the muscle) of the *impossibility* of the auricles having any thing to do with the second sound, there being no action of either auricles or ventricles going on at the moment, for it was the time of relaxation of both.

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* During the diastole the muscles are flabby, and yield to the pressure of a probe, whilst during systole they are felt to resist or rather repulse it. The heart being a forcing pump, it is merely necessary to apply one hand over it, and the other to the pulse, to be satisfied that the beat of the heart ("impulsion") depends upon the firm bulging of the muscles in systole.

Dr. Hope, in his first edition, p. 49, endeavoured to prove that this sound was produced by the "ventricular diastole," and "the blood shooting with instantaneous velocity from the auricles into the ventricles;" although, as he set out with acknowledging that the second sound takes place at the moment that the auricle is relaxed, the blood at that time could be only flowing into the ventricle gently from the veins through the auricles, as it always does at that time; for the ventricles are partly filled in this way, before the auricles (which are never empty) inject the blood into them, so as to stimulate them.

It was evident to me that there was no cause in existence at the moment to produce the sound, except the tympanic tension of the ventriculo-arterial (sigmoid) valves; or, in other words, that the sound was entirely valvular; and having established that cause as "sufficient" for the second sound, I ventured (upon the Newtonian principle) to assert it as the cause of the first sound, and can prove it to be so, the difference in form of the auriculo-ventricular valves and surrounding attachments accounting for the slight difference in duration and tone of the sounds.

These opinions, which I had discussed with friends and pupils, appeared to me such self-evident propositions, that until I found Dr. Hope and others labouring to establish erroneous explanations, I did not think it necessary to publish mine. At last I made them the subject of a communication to the Hunterian Society, 9th Feb. 1832, together with some practical observations, to shew that pathological alterations confirmed my explanation. This was published in the "Lancet," 19th May, 1832, and afterwards in the "Med. Chir. Review."

Dr Hope instituted a number of experiments, as is well known, with the endeavour to support his opinion, that both the first and second sounds were caused by the "motion of the contained fluids;" "the vibratory collision thus occasioned amongst the particles of blood producing sound." This cause, however, he relinquished for the "bruit musculaire;" and at last he was compelled to acknowledge, in his Appendix, 1835, that the cause of the first sound might be "possibly partly valvular."

In the new edition of his work, published last year, he still adheres to the opinion of 1835, except that he quite acknowledges that the first sound is not merely "possibly," but actually partly valvular; but he coincides with the opinion of the London Committee of the British Association for the Promotion of Science respecting bruit musculaire.

Now, I contend that the first sound, as well as the second, is entirely valvular, and deny that any part depends upon muscular noise ("bruit musculaire"); for when there is simple hypertrophy (increase of muscle and muscular action), there is diminution of sound, although more of the condition necessary to bruit musculaire. This contradicts his opinion and confirms mine, inasmuch as it is the valves being encroached upon, and their having less blood to stretch them, which prevents their producing the usual sound. Again, when there is moderate hypertrophy, with proportionate dilatation, there is not appreciable increase of sound; though, if he were right, the quantity of muscle being increased, there ought to be increase of sound. My explanation accounts for the sound here remaining the same, as the valves are in their usual relative condition. Again, when the heart is enormously enlarged by hypertrophy and dilatation, in which case there ought to be enormous first sound (if bruit musculaire were a cause), there is none, or scarcely any, because the openings are so dilated that the valves cannot act : thus we have pathological confirmations of my opinion.

In his last edition, 1839, he endeavours to shew that he was not ignorant of the valvular theory in 1830. He does not, however, understand it yet; he speaks of the valvularity of the second sound being confirmed by his experiments, as if he had not been labouring to overset it by his experiments, and as if I had not published the valvular theory in opposition to him, when he was experimenting to establish the erroneous opinion which he afterwards relinquished for mine : his successive publications prove the fact. He says (page 13), "that the sound was *not* attributable to the retrocession of the semilunar valves, I entertained a strong presumption." What was to have prevented him, as well as myself, from having a perfect certainty that it *was* ?

I proved the *impossibility* that the second sound could proceed from any other cause than the valves, and Dr. Hope had exactly the same data to reason upon.

In his chapter headed "ERRONEOUS THEORIES," Dr. H. states that my theory of the first sound was imperfect, because I do not add the bruit musculaire. This I deny : the valvular "cause" is "sufficient." I have accounted for the difference of sound by the difference of shape of the auriculo-ventricular valves ; their attachments are different, they are set in stronger rims, the sigmoid valves are merely attached in a tube, as it were, whereas the auriculo-ventricular have a firmer and different attachment to the parietes of the ventricle, which being in systole at the time of tension, altogether a flatter and longer tone is produced. Again, and above all, there is no sound when there is plenty of muscular action from hypertrophy, because the valves cannot act; hence *necessarily* it is the valves, not the muscles, which produce sound.

Having been the first to publish the valvular explanation of the sounds, I am bound to confute the assertion of Dr. Williams, "that I hold the same opinion as that in print by Dr. Elliott, and of which he says I was a *later* advocate :"* the fact being, that I proved the second sound to depend on the *tension* of the *valves*, produced by the backward pressure of the blood from the *arteries* ; whereas Dr. Elliott asserts, that the second sound depends upon *blood flowing* from the *auricles*, which he even puts in italics ; so that my demonstration is, that the sound is caused by the *valves* in *holding* the blood on the one side of the heart, whilst the "opinion" of Dr. Elliott, on the contrary, is, that it is caused by the *blood flowing* in on the opposite side, and he uses the word "verrit" as expressive of the sound produced by sweeping or brushing along. Again, so far from attributing the second sound to any thing but the rushing of the blood, he (following Dr. Hope) attributes the sudden nature of that sound to the rapid and vehement (as if relaxation could be vehement) diastole of the ventricle ; and its abrupt termination ("*abruptam*" in italics) to the instantaneous impediment which the sigmoid valves offer to that motion of blood to which alone he refers sound. Thus the only allusion he makes to the valves is, not as producing, but as cutting short the sound; and so far from considering the valves to be the cause of sound, he is evidently puzzled (as we may infer from the expression " fatendum est") to account for the sound ceasing when it does, " though the blood continues to flow into the ventricles after the sound has stopped," which my explanation of valvular sound renders perfectly clear: the passage shews that he looked only to the flow of the blood, and not the valves, as the cause of the sound. In fact, so far from originating the opinion of the sound depending on the valves, he does not advance that as his opinion; and in his thesis there is no originality, but a professed compilation and adoption of the opinion of others—Hope, Williams, &c.

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* "Lectures on the Physiology and Diseases of the Chest," &c. &c. By Charles J. B. Williams, M.D., F.R.S.

The following is the passage from Dr. Elliott's thesis :—" Nobis igitur (me judice) concludendum est, sanguinem a ventriculis agitatum et in arterias immissum, primum sonum cordis efficere: secundumque a sanguine pendere in ventriculos, dum horum fit diastole, ex *auriculis* influente. Hoc plane confirmatur a phænomenis quæ in vitiis valvularum cordis observantur. Naturam soni secundi *subitam* et *abruptam* oriri credo a diastole ventriculorum tam repente et vehementur inchoatâ ut sanguis vi magnâ auricularum parietes transcurrat: nec non ab impedimento quod in corpore sano fere instanter valvulæ præstant sigmoideæ sanguini, qui in ventriculos, dum horum fit diastole, ex arteriis vult refluere. Post sonum secundum quidem fatendum est adhuc plus sanguinis ventriculos inire: hic autem, ut annotat Hope, ventriculorum parietes (jam multo fluido distentos nec ultra ab illo fricatos) haud verrit, sed cum sanguine jam illic congesto, sese in silentio commiscet nec aliquid interea soni ab auriculis editur, quippe quæ sanguinem quem impellunt accurate usque sequuntur. Motum igitur sanguinis, tam a diastole quam a systole ventriculorum effectum, sonorum cordis præcipuam esse causam credendum est: quod ab observationibus quibusdam Doctorum Bertin, Williams, et Hope, singulari in modo confirmatur."

The London Committee of the British Association (including Dr. C. J. B. Williams) appointed to investigate and report upon the subject, appear to agree at last with me as to the second sound, but make the unphilosophical addition of bruit musculaire to the true cause of the first (See " Med. Gazette," Dec. 10, 1836, and Dec. 2, 1837). I say they appear to agree with me, so far as acknowledging the valves to be the cause of sound; but they do not seem to adopt the true principle, which is, that it is the tympanic tension which produces the sound. I judge from the expression in the report, that " it is impossible that the auriculo-ventricular valves should close with a *flap*, in the same way as the sigmoid valves." They speak as if the surfaces of the valves flapping together produced the sound, like the click of a solid valve; and moreover, in conformity with this, in the republication of the same opinion in the " Cyclopædia of Anatomy and Physiology," (article Heart, p. 616), edited by Dr. Todd, one of the committee, my statement is misrepresented, by saying that the first sound is referred by me to the rapid *approximation* of the auriculo-ventricular valves; than which nothing is farther from my opinion, which is, that both first and second physiological sounds depend solely on valvular tension. * * * * * * * *

FIRST PRINCIPLES

OF

MEDICINE.

THE first step towards treating disease successfully is to ascertain, as far as possible, the nature of the functional or structural *alteration* which has taken place in the *seat* of the *disease*, in one word, the *pathology:* in default of this knowledge, which is sometimes unattainable, we can only depend upon analogies, drawn from what we know to be the fact in other cases, and from *physiology*, which is a careful *observation* of the *phenomena* resulting from the *functions* of the different *parts in health.*

An accurate knowledge of the *functions* in their healthy state is the more necessary, because considerable deviations* from the ordinary routine occur without disease; as they are frequently much deranged without any discoverable alteration in the structure of the organs having taken place, pathological or morbid anatomy alone will not be sufficient to elucidate all causes of disease;† whilst, on the other hand, it is necessary to be aware that a considerably diseased change of structure may exist with little or no interruption of function.‡

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* In such instances, an undue interference with nature, purgatives, emmenagogues, &c., might do more harm than the irregularity.

† This is more especially the case in diseases of the nervous system, and points out the value of remedies which exert an influence on deranged function, without the operation of any agent capable of effecting depletion of the vessels, or of changeing structure.

‡ Such consideration will prevent disease being overlooked in an organ (as the liver, kidney, &c.) whose function is, or seems, unimpaired, when indirect symptoms and morbid sympathies exist.

The *modes* by which students may attain a *knowledge* of the *nature* of *disease*, after learning physiology, or the nature of healthy functions (which is attainable from lectures), are accurate observation of the diseases which take place in external parts as they are submitted to our senses in CLINICAL SURGERY, and in the functions of internal parts are met with in CLINICAL MEDICINE; and PATHOLOGICAL ANATOMY, the examination of the degree and nature of alteration which has taken place in the structure of the diseased part.

The object of lectures is to convey to the student, in a condensed manner, that knowledge in abstract which will enable him to understand the symptoms observable at the bed-side, and the remarks of the clinical professor; without which clinical instruction, all that the memory may be charged with from books or lectures, is but vanity.

Without entering into minute anatomy, it may be necessary, before proceeding any farther, to give a general idea of the *apparatus* which supports the life of man, consisting of the stomach and intestinal canal, called the PRIMÆ VIÆ, the ABSORBENT VESSELS, the HEART and BLOOD-VESSELS, and the NERVES.

The heart is divided by a partition, each side containing a certain quantity of blood, more or less of which is squeezed out at each beat or contraction; the blood from the left side is sent through the trunk and branches of the arteries, to nourish the different parts of the body; the overplus, and what is spoiled by use, being returned through the veins to the right side, which transmits it by arteries into the lungs to be purified (in addition to changes effected by the liver, kidneys, &c.), after which it is *again* returned by veins to the left side, thus constituting what is called the CIRCULATION. This is the nature of the circulation with which the individual born begins life, before food has been taken.

Subsequently, the process of NUTRITION is thus carried on: the *food* swallowed is DIGESTED by the action of the *gastric juice* in the *stomach;* that is, it is converted into a grey pulpy mass, called CHYME, which passes on into the intestines, where it is mixed with the BILE. The use of the bile is to *unite with* and *separate* the *feculent parts*, as white of egg is used to clear wine. Now, if a pulpy mass be allowed to stand in a vessel, the solid parts will settle to the bottom; but if rolled about in the hands, or in the manner effected by the peristaltic motion of the intestines, the more solid parts are kept in the middle, whilst the surface of the mass is the moistest; and thus a whitish liquid, called CHYLE, which was disengaged when the bile united with the feculent matter, and which caused the chyme to appear grey, and constitutes the new nourishment, is kept in contact with the lining of the intestines, where it is taken in by the tubes called ABSORBENT vessels; and these absorbents, on account of the white chyle seen through them, are called LACTEAL (milky).

The *lacteal absorbents* conduct this *fresh supply of nourishment* to make NEW BLOOD; they *deliver* it first into the *veins*, near the heart, where it is mixed with the old dark-colored (venous) blood, which has been circulated, and is on its return to the right side of the heart; from whence this mixture is sent through the lungs, to be purified, where it becomes bright scarlet arterial blood, and is then returned to the left side of the heart, which sends it through the arteries all over the frame, to supply its demands.

All the business of constant support and renewal of parts, and supply of secretions, as the growth or repair of bone, muscle, membrane, and other structures, the formation of bile, saliva, mucus, and other secretions, is carried on by the extreme minute branches of the blood-vessels; and whilst they preserve their proper tone and size, all goes on well; when their action is deranged, disease commences, often prefaced by pain or other disorder of the nerves. The ultimate minute branches of the arteries, from their fineness, are called CAPILLARY (from *capillus*, a hair.)

The *colour* of the *blood* is caused by red PARTICLES diffused through a transparent fluid, liquor sanguinis, composed of serum holding fibrine and other substances in solution. When blood is first drawn, the red particles may, by means of a microscope, be seen floating in the serum; but when it stands, they settle down to the bottom, in the fibrinous cake or clot (called cruor or crassamentum) which forms by coagulation.

Some capillaries are too small to admit many of the red particles, unless when they are enlarged by inflammation, as in the eye, which, when inflamed, changes from white to red; besides which, even the red capillaries are so minute, that they are not visible individually to the naked eye till enlarged by inflammation.

The body is nourished by the arteries depositing in appropriate parts the various constituents of blood, which is sent through them by the heart. In this way muscles, bones, membranes, &c., grow and are nourished; for the blood contains the constituents of each: fibrine, &c., for instance, to make muscles; lime, &c., for the bones; albuminous and watery fluid for the formation of membranes, and to supply the secretions and exhalations which are necessary to lubricate the mucous and serous membrane.

Though a consideration of the phenomena resulting from these depositions will assist us in our explanation of disease, we cannot exactly ascertain how the depositions themselves are originated. Do arteries build up a bone merely by the addition of homogeneous matter? And, are the secretions and exhalations modified by the *calibre* of the minute branches *admitting* only the vapory parts to the surface of the serous membranes and of the skin, whilst they permit the transparent fluid parts of the blood to pass to the mucous surfaces, and keep back the red globules? This mechanical explanation might suffice in part, in the instances adduced: but when we come to the nutrition and renewal of muscle, and the formation of peculiar secretions, we must look for some still uncomprehended agency, which modifies the materials conveyed by the arteries whilst they are depositing: even with respect to the deposition of bone, this agency is required to solidify the new particles which are fluid n the blood. This power can be no other than chemical; the processes, when examined, will be found to be chemical *precipitations*, by which new matter is deposited, and *decomposition*, by which old matter is separated and then carried off by absorbents; and thus the support of the frame in health, and the changes of disease proceed. In this investigation we may advance a considerable way, though we cannot come to the knowledge of the ultimate principle on which organic life depends, or we should be able to construct a man. As an instance how far we can go, we can analyse bone, and we may explain how bony matter is deposited from the blood by precipitation; and we know that the shape depends on the periosteum, or membranous mould in which it is cast: but here we stop; we cannot discover how, in the minute embryo in the womb, the membranes were first determined in their shapes; we here arrive at the confines of our knowledge; and must confess an infinitely wise

First Cause, who does not permit us to know more than the phenomena by which we can judge how, in many instances, to avail ourselves of the means to regulate the complicated apparatus which He has endowed with life.

The deposition of bone is a combination of chemical precipitation and crystallisation, modified by vital actions ; as, for instance, when there is periosteal membrane, we see that it keeps up a vital state of bone, whether in the bone of a leg or tooth ; when there is no membrane attached, as in the enamel of the tooth, crystallisation, with the temporary membrane which forms the mould, decides the form of aggregation ; in case of fracture of a bone, the surrounding parts decide the form of the callus which reunites it. Whilst bone is growing (as shewn by the common experiment of feeding young animals with madder, so as to produce variegated deposits), there is a change as to deposition of the bony matter going on ; but there is no reason to suppose that the substance of a healthy sound bone of an adult is changing, any more than of a tooth, or the wall of a castle, though there are preparations ready to repair a breach, if made.

During health the capillary arteries continue their work of nutrition and secretion, the muscles are fed, the mucous surfaces are lubricated just enough to prevent any sensation from the substances which pass along them, the serous surfaces are made sufficiently moist to slide upon each other without sensation, and the skin is kept soft by an insensible vapor. All this time there is another process going forward also, which is the *removal* of *superfluous matter* by the *absorbents:* if it were not for these, there would be inconvenient accumulation of what is deposited by the arteries: the serous cavities, as that of the abdomen, for instance, would become dropsical, if the capillary arteries went on moistening the internal surface, and there were no absorbents to carry off the superfluous moisture. Thus we see that absorbents take up the nourishment from the food to supply the wants of the system ; they also take up the particles which become superfluous, according as the arteries deposit fresh matter: and these absorbents, like the lacteals, mix their contents with the old blood to be repurified. The deposit, or precipitation of solid matter by the arteries is not difficult to be understood ; and we can, by a reference to chemical action, account for the *removal* also of *solids;* for solids become *fluid* (or gaseous) by what is called spontaneous *decomposition*, and thus *removable* by *absorbents*. Now, whilst bone is healthy, it is protected by its membranes from the action of solvents; but when carious from disease there is an extravasation of *serous fluid* in *contact* with it, which helps to dissolve it, and when dissolved, the absorbents will carry away the solution.

The REMOVAL of BONE by the *pressure* of *tumours*, aneurysms, abscess, &c., as well as the CHANNELS left in *exostoses* for the *vessels* which *traverse* them, is effected by *pressure against vessels*, *not against bone.* The pressure of a tumour causes death of the part of bone, by compressing its vessels, and so stopping the supply of nourishment; the bone, when dead becomes decomposed, and is carried off by absorbents. As to the channel in the growth of an exostosis, or in the natural growth of the bones of an infant's head, it is merely the deposit of bony matter *by the side* of those vessels which previously existed. Thus so soft a body as the brain of a young person causes the hard skull to grow larger.

Arteries are endowed with the power of contracting on their contents, so as to continue full even when a considerable quantity of blood has been lost either by hæmorrhage or artificial means. This contraction is the action of arteries, and is distinct from, and opposed to, the contraction and action of the heart. This point it is necessary to understand clearly in speaking of the phenomena of disease.

The contraction of the HEART is *muscular*—of the ARTERIES *elastic.* The HEART *contracts* and relaxes ALTERNATELY. The ARTERIES keep up a CONSTANT *contractile pressure* on their contents; not, as has been commonly supposed, an alternate contraction and relaxation, but a continued contractile effort, both longitudinally and transversely, which is overcome by the action of the heart: when there is much blood sent into them, they are distended; and if there be little blood sent into them, as after hæmorrhage, their tendency to contract causes them to close, so as to keep always full, and to preserve a continuous stream of the blood, even during the temporary relaxation of the heart; and the ARTERIES YIELDING, and adapting themselves to the pressure of the heart, and RECONTRACTING on their contents, whilst the heart is relaxed and filling, is the CAUSE of the EQUABILITY of the STREAM in the VEINS; nay, the stream even in the arteries is much less in jets than is supposed by those who judge from the mode of its flowing from a wounded artery: for though, when there is a free escape from the wound, the impulse of the heart causes an unequal stream, it must be remembered that in the tube unwounded that force would have been partly expended in stretching the artery, whereas the artery when wounded ceases to be other than as a simple tube, the elasticity not being called into operation, on account of the escape of the blood from the wound.

The most simple mechanical illustration, perhaps, is the double bellows of a smith's forge, which keeps up a constant current of air, though the handle works with intermissions; so that the blast into the fire would be in puffs, if it were not for the weight on the upper half of the bellows, which keeps forcing out the air in a continued current, whilst the hand is drawing back to make another impulse.

It has been supposed that the circular fibres of the ARTERIES were muscular; that they contracted and relaxed at each pulse; and that the throb felt was caused by a dilatation of the artery. Those fibres are NOT MUSCULAR;* although they bear some resemblance to the muscular coat of the alimentary canal. On the outside of the circular fibres, a yellow fibrous layer exists. The contractile and elastic power of the arteries is due to the peculiar combination of materials, constituting the middle coat of the arteries. This structure is firm, and, though elastic, does not yield to the force of the heart at each beat, but on the contrary, preserves the CALIBRE of the artery UNIFORM, as may be seen by laying bare an artery in a living animal, or when the artery is exposed in an operation: it is, for the most part LONGITUDINALLY that the arteries are STRETCHED at each injection from the heart, by which their capacity is increased; the consequence of which, from their being bound down in various places, is, that there is a SERPENTINE motion in the artery where it is at all loosely connected.

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* This has been confirmed by the microscopical investigations of Schwann and Eulenberg (*De Tela Elastica*, Berolina, 1836); whereby the long-continued controversy concerning the muscularity of the arteries is completely set at rest. They have unequivocally demonstrated that the middle coat of the arteries is composed of that peculiar elastic tissue (*tela elastica*) which constitutes the ligamentum nuchæ of vertebrated animals, the ligamentum flavum of the vertebral column of man, &c. No muscular fibres whatever can be detected intermixed with the elastic tissues of arteries, as cellular tissue alone connects the various tunics.

The fibres of the middle coat of the artery, being arranged circularly, allow of their separation laterally, and thus *accommodate* themselves to the *elongation* of the tube, whilst they *resist* its *dilatation*. Now it may be thought that the motion of the arteries *seen* at the wrist and in the temple is their dilatation; but it is the serpentine movement caused by the alteration of the curve, the artery being elongated at each injection from the heart.

Where the artery is perfectly straight, you may lay it bare and scarcely see it move; but the moment you compress it with the finger, or tie a ligature round it, you perceive it pushed at every pulse. To illustrate the deception of the sensation which the pulse gives, as if the artery were dilated at each beat; if a long vein, removed from the body, have a syringe adapted to one end, the other being raised or arranged with a spring-valve, which yields to the jets so as to keep it full, and fluid be sent through in jets, it will, upon pressure by the finger, give the sensation of dilatation, but the eye perceives none. Again, if any one grasp the leather tube of a fire or garden-engine, the sensation given will be that of its expanding in the hand at each stroke of the pump; but the eye contradicts the sensation: it is merely the tendency to resume the cylindrical form from the outward pressure of the fluid, but not expansion.

Some writers have *attempted* to prove that the heart has an *active power of dilatation*,* by which it helps to *refill* itself by sucking in the blood, as it were; and one proof is brought forward, from the heart of any of the large mammalia, as the horse, ox, or whale, which affords the phenomenon of contracting and expanding after removal from the body: but the expansion is simple relaxation; and when a large heart is relaxing, if the hands be pressed on opposite sides of it, they will be sensible of an apparently active expansion from the mere gravitating recovery of position of such a mass of matter; the heart, in fact, not opening actively, but *falling open after* each *contraction.*

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* The impulse of the heart against the side (which takes place just as the auricles have filled the ventricles, and the latter become rigid, commencing their contraction) is in proportion to its muscular action, and is produced by the heart assuming a form more approaching to the globular, and becoming firm at the same time, giving the hand a sensation similar to what is felt when it is applied to the calf of the leg or to the jaw, and their muscles put in action; the heart being in an angle between the diaphragm and parietes of the chest, the increase of its transverse dimensions has the effect of the driving of a wedge, thus forcing itself against the ribs. Now, these actions may be very strong, but if they be too rapid, there is not time for the heart to receive the usual quantity; so that, only a little being sent into the arteries at each contraction, the pulse may be small when the heart is acting strongly, as in palpitations; and an ignorance of this fact might lead to the administration of stimulants when not required, to say the least, if the pulse alone were consulted: *cæteris paribus*, "impulsion" is increased by hypertrophy, diminished by dilatation The ventricles contracting on a small quantity produces the phenomena of "impulsion;" the ratio

It will be shewn now *by what means* the *blood fills* the *right auricle*, which, being flaccid, is easily distended; but it requires the muscular action of the auricle in addition to fill out the more dense ventricle,—this is the use of the auricle: it would be unnecessary if the ventricle had an active power of dilatation, *natura* (*Deus*) *nihil agit frustra.* It is the constant pressure and equable stream which refills and distends the right auricle of the heart after each contraction; not any suction, to use a vulgar expression, of the heart, or suction of the chest, as has been attempted to be proved; no effect of vacuum and atmospheric pressure. There is no suction,[*] no atmospheric pressure, during *natural* respiration; for the glottis is sufficient to admit a free current of air: it is only in croup, or labored respiration of some kind, as of an animal under experiment, that there can be any effect of atmospheric pressure.

A reference to the hydrostatic principle of fluid in bent tubes finding its level, will be sufficient to account for the capability of the heart to send the blood, with little effort, all over the frame, and for the refilling of the heart after each contraction. The heart sends the blood against the force of gravitation through but a small portion of the system; for in all the natural positions, upright or horizontal, by far the greatest portion of it is below the level of the heart. Now the blood, being confined in the arterial and venous tubes, will,

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of thickness of parietes to cavity being altered gives a deceptive sensation, as if there were hypertrophy, which has misled many to predicate hypertrophy where it did not exist, in hysteric and other nervous states. The sounds of the heart are produced by the sudden tension of its valves. (See "*Advertisement*" *to second edition*)

[*] Sir David Barry endeavoured to demonstrate that a suction, or atmospheric pressure, was produced by the expansion of the chest, exerting an influence in promoting the circulation; and the Committee appointed by the British Association to investigate the causes of the sounds of the heart revived (1840) this opinion, which appears to me to be inconsistent with the laws of physics.

of course, on hydrostatic principles, return to the same level from which it flows; and as to the capability of the muscular power of the heart to inject the parts that are above its level, when any person compares the force necessary to be used in doing so, with the force which an equal quantity of muscle in the arm is capable of exerting, it appears trifling: besides, whoever applies the hand to an aneurismal tumour may judge of the power of the heart. The blood, then, returning from the parts above the level of the heart, tends to refill it by gravitation, even if not aided by the contractile pressure of the arteries; the blood below the level of the heart, or rather arch of the aorta, returns by the tendency to find its own level; so that the BLOOD is PRESSED into the RIGHT AURICLE by the *weight* of the *returning blood* from all the parts *above* the level of the *heart*, added to the *pressure* caused by the *difference* of the *height* of the *arch* of the aorta *above* the *right auricle* of the heart, and, in addition, by *whatever remains* of the *contractile* pressure of the *arteries*. Another consideration has generally been omitted in calculating the power and facility with which the influence of the heart is communicated throughout the arterial system, which is, that any retardation which might take place from the friction through the tubes, is more than compensated by the sum of the branches being greater than each trunk from which they arise, so that the flow is facilitated; whilst, on the hydrostatic principle of Bramah's press (the hydrostatic paradox), though the injecting force of the heart is spread over a greater space, it is not weakened, being multiplied, not divided.

We must not consider the contractile effort of the arteries as one of the moving powers of the blood, any more than the fly-wheel of a machine, or the weight on a double bellows, which only regulate motion, and are, in fact, a burden on the moving power, though they continue the motion for some time after the moving power has ceased to act. The moving powers are, the *contractile force* of the heart,* *gravitation*, and the hydrostatic principle above stated, of the *tendency in fluids to* RETURN *to the same level.*

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* Let it not be objected, that some lower animals, which have no heart, have still a circulation: the alimentary canal performs the double function of stomach in making the blood, and heart in sending it on when made; as, in my opinion, the contraction of the alimentary canal of the higher animals sends forward the chyle in the lacteals.

By anatomical investigation, then, we ascertain that tubes of various dimensions, called vessels, and which are named arteries, veins, and absorbents, are apparatus of every process in the *growth* or *removal* of all parts in *health*, and in the *swelling* or *wasting* of parts in *disease*. Moreover, we must not forget,—and it is a circumstance to be recurred to perpetually, both in theory and practice,—that *nerves*, *accompanying* the *arteries* throughout, complete the apparatus.

The NERVES are whitish threads, which are distributed to every part of the frame, however minute; communicating with the brain, for the purpose of informing it of what is going forward in different parts, as when anything touches the hand, tongue, &c.; and for the purpose of conveying the mandates of the will from the head to the muscles of voluntary motion; and again, supplying to *all parts nervous influence* which excites *action*.

The nerves communicating with the brain do not blend as they unite into larger and larger trunks, but preserve their individuality, however aggregated, like threads in a skein, or strands in a rope.

When we speak of the nerves supplying to *all parts nervous influence*, which excites *action*, reference must be had to the spinal cord, and sympathetic or ganglionic system, as well as to the brain.

We have reason to believe that the nervous influence is generated, or secreted, in the more vascular cineritious (grey) part of the nervous system, and conducted by the medullary (white) part; the *medullary* part in the *spinal cord* and *brain* being an *aggregation* of nerves from the frame.

A variety of circumstances lead us to the conclusion that the nervous influence is analogous to, or depending upon, if not identical with, the electric principle, or fluid, whatever that be.

1. The contraction of muscle by passing electricity along the nerve to it, either in the living body, or when dissected out.

2. Volition is conducted along the nerves with a speed equalled only by electricity.

3. The extrication of caloric, called animal heat, is analogous to the gradual action of a galvanic apparatus, &c. &c.

It is necessary here to state distinctly my opinion respecting ACTION, as depending upon the NERVES. I consider that the *muscles* and *capillary arteries*, though *differing* in *tissue*, have each inherent in their structures a faculty of contracting, *organic contractility: this contractility* being *acted upon* by the *nervous influence*, the *result* is *contraction*, the nervous influence being discharged into them from the nerves; and this discharge may be produced in a variety of ways, as by the blood in the heart or capillaries, the presence of food in the intestines, in muscle by the will or the electricity from a charged jar—these being known agents of contraction in the animal.

All organic action is contraction, produced by nervous influence. This is termed by Bichât, contraction from "organic contractility," resulting from "*organic* sensibility," which he distinguishes again from *animal* sensibility; thereby making it appear that the nerves act upon an ideal inferior sensitiveness in the structures, not confining sensitiveness to the nerves. Now, by his "*organic sensibility*" must *not* be understood *sensitiveness*, but that liability, or *capability*, of *structures* to *answer* to *nervous influence*, in the same manner that steam or any other agent produces action in a mechanic structure; this is, in fact, *organic contractility:* so that he divided one property into two.

What Bichât calls ANIMAL *sensibility*, is that function of the *nervous system alone* by which communication is kept up with the sensorium, and by which pleasurable and painful impressions are perceived: his ANIMAL *contractility* is merely *organic contractility* of *voluntary* muscles called into action by the will; but I would not give organic contractility a new name, merely on account of the different orders of muscles receiving their influence in one instance from voluntary nerves, and in the other from involuntary nerves. Pain is the result of injury done to the nerves, and nerves alone, the union of nerve with other tissues being only to convey sensation, or to effect action: *sensibility*, therefore, is in the *nerve*. When pain takes place from injury, in parts which, though not under the control of the will, are still abundantly supplied with (organic) nerves to produce action, as in the heart or intestines, Bichât says this pain is "organic sensibility (action*) augmented" until it "becomes* animal sensibility" (*Système Capill*, § vi.); but, on the contrary, it may be seen that "organic sensibility" (action) is diminished in parts where there is pain (in the *sensitive* nerves) from inflammation.

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* It is impossible to separate them. We know nothing of organic sensibility or organic contractility, except so far as evinced by action taking place.

In fine, I prefer the term *organic action* to *organic sensibility*, and do not make use of the term "*animal*" sensibility at all. I use only the terms, *organic action*, and *organic contractility*, of the contractile tissues; and *sensibility*, of the nerves.

Bichât, I repeat, makes an ideal inferior sensitiveness in the structures, not confining sensibility to the nerves, as he says, "the nerves are strangers to *organic sensibility*:" this leads him to become visionary, when he speaks of the lacteals exerting a choice as to what particles they will take up; which is mere chemical or nervous effect on their tissues, making them cease to absorb what is unfit for them, whether that be by the unfit matter causing them to contract and shut against it, or to relax so as to lose power; still no election in them, any more than elective affinity of chemistry. From thus refining too much upon the functions as connected with vitality, he overlooked the more simple explanations which physics afford, and says that "it is ridiculous to attempt the explanation of the phenomena of changes in animal functions by mechanical laws and the variations in dimensions of vessels, &c." but I think I have shewn that what he calls vital laws, are but these mechanical laws modified by the Deity: we do not know the intimate structure or mechanism by which a muscle or capillary contracts; but doubtless it is as simple as a pair of lazy tongs, and as easily excited to action as they are by the hand, or the piston of a high-pressure engine is by the steam. There is no subject more interesting, no pursuit more gratifying, than this investigation of the properties and processes of our animal frame: there is no subject of contemplation which gives us so exalted an idea of the omniscience of the Deity, and so humble an opinion of all human inventions, as the excelling utility and efficiency of all its parts. How beautiful, how wonderful, then, must be the Soul, when such infinite wisdom, such exquisite arrangements, are lavished on the structure which it is destined to inhabit for but a short space of time! Such perfection in our organisation leads us to believe with Job, that, however disarranged by death and decomposition, it may again be recalled into re-union, and that "in our flesh we shall see God."

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* As they depend on different sets of nerves, one cannot "become" the other.

The ANIMAL HEAT has been accounted for in different ways by several ingenious physiologists; from the aggregate of their opinions and experiments I deduce, that *heat* is *extricated all over the frame;* in the *capillaries*, by the *action* of the *nerves* during the *change* of the *blood* from *scarlet* arterial to *purple* venous; and *also* whilst it is changing *in the lungs* from *purple* to *scarlet.*

There is a perpetual *deposition*, by the capillary system, of *new matter*, and decomposition of the *old*, all over the frame, influenced by the nerves; in other words, the galvanoid or electroid influence of the nerves, which occasions these depositions and decompositions, keeps up a slow combustion. In this decomposition there is a continual disengagement of carbon, which mixes with the blood returning to the heart at the time it changes from scarlet to purple; this *decomposition* being effected by the *agency* of the *nerves*, produces constant extrication of caloric: again, in the lungs that carbon is thrown off and united with oxygen, during which *caloric* is again *set free;* so that we have in the LUNGS a CHARCOAL FIRE constantly burning, and inthe OTHER PARTS a FIRE of VEGETABLE or ANIMAL fuel, the one producing *carbonic acid gas*, the other *carbon;* the *food supplying*, through the circulation, the vegetable or animal *matter* from which the *charcoal* is *prepared* that is *burned* in the *lungs.*

It is thus that the animal heat is kept up: on the other hand, the EVAPORATION of PERSPIRATION keeps the SURFACE COOL; but in inflammatory fevers, where this is *deficient*, the body gets too *hot;* and in low fevers, when the nervous influence is not sufficient to keep up the full fire, the surface gets cooler than the natural standard. This is peculiarly evident in the beginning of eruptive fevers, as scarlatina, where there is strong heat, with the arterial colour of the skin; but if the same becomes malignant and low, with deficient arterialization, the temperature sinks, and the diminution of the charcoal combustion in the lungs is evinced by the dusky colour of the skin, shewing that the carbon is not thrown off as it ought to be: and the same phenomena takes place in typhoid cases, and still more so in malignant cholera.

Whatever NERVOUS INFLUENCE may be, or however generated, we know that the *energy of parts* depends upon a something that is communicated to them by the *nerves* in conjunction with the ganglia, brain, and spinal cord; that while parts are supplied with this nervous influence, they retain their power of action, and not longer; that arteries become less susceptible of impression from external agents when the nervous energy is low; that when the vital powers are sunk, the capillary arteries cease to secrete; that various *phenomena* in the *healing* of *inflammation* are the effects of *healthy action* of the heart and arteries. We find likewise when *nervous energy* is *deficient*, that parts which had advanced to a certain stage of healing become flabby, as in stumps after operation when the patient sinks; and that when the power of the constitution, the nervous energy, fails, nitrate of silver will have no effect upon ulcers, except chemical decomposition—not that astringent effect which is the result of contractility depending on vitality. It is well known likewise, that a blister not rising from a cantharides plaister is a bad sign, as being an evidence of approaching, or rather commencing, death; this must not be confounded with a want of action in the arterial capillaries—the cause here is a want of injecting force in the heart; but no vesication will take place even from boiling water, when the vital powers are sunk, as the *heart* has not power to effuse serum. This is a more satisfactory example than cantharides, because the effect of the hot water goes so far as to produce the local injury, for the cuticle may be separated or loosened by the mere chemical effect of the heat; but this takes place equally in a dead body.

With respect to the action of the heart, all are agreed that its action is contraction, by which the blood is sent forward in the arteries, and that the power of the heart's action is measured by the PULSE when there is no organic alteration, such as ossification of the valves at the beginning of the aorta, aneurism, &c.

The action of the arteries also is acknowledged to be contraction, whether considered muscular or not; but there is some difference of opinion as to the degree of action of the arteries in inflamed parts. It is very common to say, that in INFLAMMATION there is an increase of arterial action; but a consideration of the phenomena, and of the nature of arterial action, will shew that in INFLAMED PARTS the

CAPILLARY ARTERIES are WEAKER in their action; that there is DIMINISHED ARTERIAL ACTION, for the action of arteries is contraction: now the arteres in inflamed parts are evidently larger than before—less contracted, that is, acting less.

An inflamed part is redder and swelled; where the vessels are visible, as in the eye, we can see that the redness is caused by the minute vessels becoming larger, so as to admit more blood. This enlargement of vessels is not from increased action, but, on the contrary, from their action being diminished, their giving way, and being *dilated* by the injecting force of the heart. The way to diminish the inflammation is, by increasing the action of the arteries, as by cold or astringents, which make the arteries contract, that is, increase their action; so that, so far from the arteries in an inflamed part being in a state of increased action, one of the means of *diminishing inflammation* is, by *increasing* arterial *action* in the part inflamed. It is common to remark the *throbbing* of the carotid arteries as increased action; but the more they throb, it shews that they the *more yield* to the injecting force of the heart. When the eye, or any other part, is injured by heat, a stream of cold air, or a blow, or cantharides plaister applied to the skin, &c., the part becomes redder from the vessels enlarging and admitting a greater proportion of blood than there was before. Now in this first and simplest instance of inflammation the heart does not act more strongly than ordinary, not affecting the pulse; so that the capillary arteries evince debility, having given way when there is no more force than they bore before without distension; from this they sometimes recover of themselves, gradually contracting to their natural size; or if not, the simple application of cold, or an astringent lotion, makes them contract, and the redness disappears.

It is the opinion of some persons, even at the present day, that the motion of the *blood* is *accelerated* in inflamed parts; though the experiments of Parry and others proved the *contrary* to be the case, as follows from the *capillary arteries* being *enlarged;* inasmuch as when fluid passes through a given space, the current beyond that will be slower in proportion to the wideness of the channel; as in a wide part of a river, where the current becomes slower; and the same may be observed by passing water mixed with grains of amber, through a glass tube with a bulbous enlargement in the middle ; the current will slacken in the bulb, and resume its velocity beyond it.

Some will allow that the capillary arteries, where the blush of inflammation is, are weak, as they visibly have given way ; but they will speak of *increased arterial action,* and say that the arteries *around* or leading to the inflamed part are in increased activity, as a part of the condition, or of what keeps up the inflammation ; not considering that an increase in their action would be contraction, and consequently a diminution of the flow of blood to the inflamed part ; in fine, an increased action in the arteries both in and leading to the inflamed part, is just what is required to diminish the inflammation.

But so far from the arteries leading to the inflamed part being in a state of increased activity, we have obtained evidence that they also become weak when the inflammation continues for some time. Hausmann, to whom we are indebted for many valuable experiments on inflammation, has made a series of preparations of the leg of the horse, in which inflammation had existed, shewing the participation of the larger arterial trunks in the inflammatory condition of the *capillaries,* dilatation having spread from the minute vessels of the part inflamed to the main arteries of the limb. The increased throb which is apparent in these during life confirms my remarks on the subject, that the throb and full feel of the pulsation is an indication of the artery having given way to the injecting force of the heart. Another argument brought forward by the advocates of increased arterial action in inflammation is, that an incision in an inflamed limb, as in phlebotomy or arteriotomy, will bleed much more freely than the corresponding sound one,—to which I would answer, that it simply demonstrates that the arteries contain more blood, in consequence of having become enlarged from diminished action.

The more the heart acts, the more of course it forces the arteries of the inflamed part ; and the *pulse,* shewing the power of *action* of the *heart,* is erroneously by some considered as an evidence of arterial action ; the throbbing of the carotid arteries, for instance. As the heart, therefore, acts against the capillaries, if we cannot cause them to contract strongly enough to resist its force, we are obliged to diminish the force of the circulation, either by taking away blood, which decreases both the quantity of blood sent to the arteries and the action of the heart itself, and in this way we leave less for the arteries of the inflamed part to do ; or, we can lower the force of the heart by medicines, such as digitalis, &c. Here, for illustration, the simplest cases of inflammation have been taken, in which the heart is acting naturally, the inflammation being from injury.

Sometimes parts are loaded with blood when we cannot find evidence of inflammation, and which state is called *congestion.* Inflammation or congestion are but varieties of distended vessels, which, if they cannot unload themselves, we assist by applications or medicines which make them increase their contractile action ; or if that alone is not sufficient, by taking off some of the force which injects them, or, as it called, the *vis à tergo.*

The difference between CONGESTION and inflammation is, that in congestion there is merely distension of the vessels; in inflammation there is, in addition, alteration of tissue—actual deterioration, more or less, of the structure of the capillaries. Thus congestion may be produced in a part by a ligature; by the pressure of a tumour; by obstruction to the course of the blood, as by diseased valves of the heart: and vessels thus congested may remain so for a great length of time, and quickly resume their natural state, when relieved from the pressure of obstruction; in fact, the vessels cannot be said to be diseased. But the case is different with inflammation ; the fault commences in the tissue. As soon as a want of that harmony between the nerves and capillaries, which is necessary to organisation, takes place, their fine tissue begins to decompose, the particles which were held together by this inscrutable agency begin to be precipitated from one another ; and this takes place in every shade and degree, from the slightest scorch of the fire, or blush from the wound of an insect, to mortification and putrefaction.

When the valves of the heart are diseased, the obstruction thereby caused in the circulation produces congestion in the lungs, which is very different from the state of inflammation or peripneumony.

Let us see how far we can go in proving that the *capillaries depend* upon *nervous influence* for their contractile *action.* Blushing is, perhaps the most unequivocal proof that an alteration in the nerves is the cause of sudden dilatation of the capillaries. It is not the action of the heart alone which causes the partial flush;

for first, the heart often acts stronger without causing blushing, and, next, the blush is partial; whereas, when the mere action of the heart causes increased redness of the skin, as from exercise, it is not partial, as it is in blushing from mental emotion. And this, which is sudden weakness of the capillaries has been commonly attributed to the "increased arterial action," and "determination to the face." I attribute this giving way of the capillaries to derivation of the nervous influence, which, being directed to or expended in the brain more freely by mental emotion, robs, for the moment, the capillaries of the force of their energy.*

What is called the blush of inflammation may be brought on in a part by reiterated strong electric sparks. It may be said that the effect of the electricity is on the tissue of the capillaries; but the first effect produced is pain, shewing that the operation of the electricity commences on the nerves, sensitive as well as organic.† The same observations are applicable to the blush produced by heat from a fire; and we have a proof that this is the effect of nervous injury or alteration of the structure of the vessels, by the common experiment of those who have resolution to hold the burned or scalded part to the fire, and remove it gradually, which will prevent the disorganisation that would otherwise take place—in common language, prevents blistering. The mischief is caused by exhaustion of the nervous influence; the sudden removal of the excitant leaves the capillaries destitute, and they *yield* immediately to the *ordinary injecting force:* but if the excitation be renewed, by holding the part to the fire, nervous influence is supplied from the neighboring parts to the capillaries, with pain certainly, but, by slowly removing from the heat, the nervous influence will be gradually supplied, till the excitant be reduced to a natural standard, relieving the pain and incipient inflammation. On the same principle may be explained a fact pretty generally known, that if melted sealing-wax be dropped on the skin, and be immediately removed, the skin will blister, or at least feel scorched, and remain painful for some hours; but if the wax be allowed to cool gradually before removal from the skin, the pain, though severe during the cooling, ceases immediately, and no blister arises. These I consider to be proofs that the diminution of nervous influence, rather than alteration of tissue, is the proximate cause of the relaxation of the capillaries; for if it were alteration of the tissue, not diminution of tone, the renewal of the heat would add to the previous mischief, instead of affording relief.

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* Fear, which for the moment diminishes the action of the sensorium, has the opposite effect.

† An animal may be killed by a strong electric shock, or by lightning, and not the slightest injury of the vascular tissues be discoverable by dissection; and as we know that the nervous tissue is the part affected by electricity, its lesion must be inferred to be the cause of death.

The *progress* of inflammation shews the dependence of the capillaries on the nerves. A part may, in certain cases, be observed to become tender before it is red; for it may be observed by experiment that the pleura or peritoneum of an animal is not extra-sensitive immediately on exposure; it first becomes tender and then red. In inflammation of the conjunctiva of the eye, it is painful, feeling as if there were sand under the lid, some time before its vessels are enlarged. The pain of erysipelas precedes the redness. The action of cantharides in producing inflammation, is another proof that inflammation begins in the nerve; for cantharides have no effect on the tissue of the capillaries, do not corrode or act in any way on their substance after death, when the nerves have no influence; whereas any really corrosive agent would act even more on the dead than on the living capillaries. Without, therefore, at present seeking for further proofs, I deduce from blushing, and from the effects of electricity, fire, and cantharides, that the capillaries are dependent upon the nervous system for that tone or energy which preserves them from over-distension. The brain, spinal cord and nerves, again, depend upon the due nutrition afforded by the arteries, which supply them with scarlet blood.

Though Bichât denies the influence of the nerves, or says that it is almost nothing, in secretion, exhalation, &c., I consider that the sudden alterations of these from mental emotion prove the contrary; besides the proofs already advanced, that capillaries, which are the agents of these functions, derive energy from the nerves.

A cautious application of electricity to an eye red from chronic inflammation will cure it. Spirits, oil of turpentine, squills, even solution of cantharides, &c., applied to a wound, or, through the circulation to a secreting organ, will cause the capillaries to contract; in reality, stimulate them to action (contraction). But the same agents, applied too strong, exhaust the nervous influence, and relaxation (which has been erroneously called arterial action) takes place. This will account for the use of certain remedial agents to diminish inflammation, which, when pushed a little further, irritate, and subsequently produce inflammation.

It is sometimes remarked, that "local irritation *detains* the blood" in a part, as if by some obstruction or attraction; whereas this phenomenon may be explained by the increased capacity of the vessels causing a slower current, as before stated, thereby allowing the blood to be delayed. Besides the expression *detention*, and the terms *congestion* and *inflammation*, there is another word, DETERMINATION, used to express an habitual reception of more blood than natural in a part; "determination of blood to the head, with throbbing of the carotids." The throbbing of the carotids has been already explained not to be active, but passive. Now, the word *determination*, in ordinary language, implies that blood is sent somewhere in particular; but the heart has no power to direct any blood to one part more than another, although, if in any part there be an unusual relaxation of the vessels, they will receive more than ordinary; as, when the water is sent through the main pipe of one of the water-works, it cannot be determined to any house in particular, but whichever house has the largest cistern will receive most water.* By this I wish merely to illustrate, that what is called determination is not active, but passive. The term also used by Bichât, of the blood being drawn or invited into an inflamed part, may be explained on the same principles.

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* We have an interesting physiological illustration of this principle in the "determination" of blood alternately to the stomach and spleen. A given quantity of blood is constantly sent through one arterial channel, which branches off to the stomach and spleen: when the stomach is empty and collapsed, its arteries being likewise collapsed, the blood passes into the spongy texture of the spleen, so constituted and situated as to be ready to receive it; on the contrary, when the stomach is distended with food, its elongated arteries admit the blood freely, and consequently the spleen, being then less forcibly injected, collapses and contains less blood. The spleen thus performs the office of a mill-pond, by receiving the surplus of the stream when not required for the mill, the stomach; and, by this contrivance, the quantity of venous blood sent to the liver from the two organs does not fluctuate. I have never found reason to alter this opinion respecting the use of the spleen, which I advanced in my Thesis. Again, we have an illustration from comparative physiology: according as the lungs and thorax become developed in the tadpole, there is an increased development of arteries and capillaries, exactly equivalent to what is called determination; but the increased influx of blood is merely the result of increased vascular capacity.

Irritation, continued excitation of the nerves of a healthy part, as just shewn, at last produces inflammation, by exhausting that nervous influence which gives the capillaries power; they thus become weakened, allow of over-distension and the part is in the state of inflammation or congestion. This effect may be produced by electricity, which acts palpably through the medium of the nerves; so redness produced in this way is as evidently through the abstraction of nervous influence as blushing.

Thus, in a part inflamed there is a diminution of organic action, in consequence of which the blood is admitted in excess. As long as the capillaries are supplied with nervous influence, as long as they possess perfect organic action, they preserve a due size; when they lose it, either from the influence not being supplied from the nervous system, or are robbed of it by heat, electricity, cantharides, or other cause, they give way, and admit more blood than before. Taking this view of the proximate cause of the enlargement of capillaries, we can account for all varieties of congestion, from a simple transient blush to the stage with which inflammation commences; and it must be impossible to draw a line between congestion and inflammation, one passing into the other by insensible shades. Hence the numerous terms used by authors to express the gradations of distended capillaries: congestion active and passive, engorgement, hyperæmia, erythema passing to erysipelas, &c. When the congestion or inflammation subsides without solution of continuity, or leaving any trace behind, it is called RESOLUTION; and it is very intelligible how coid and astringents promote this desirable termination; as does also a means not so commonly applied, an even bandage with gentle general pressure over an inflamed limb.

This leads to an *explanation* of the *diminution* of SECRETION in an organ, at a time when it is, when it is, in fact, fuller of that material (the blood) from which it secretes, than ordinary, as the kidneys, the skin, &c.; and enable us to account for the dryness of skin and scanty secretion of the kidneys in fever, &c., without reference to Cullen's doctrine of spasm, by an increase in diameter of the capillaries; not from obstruction, but, on the contrary, from too much room.

Secretions are carried on by fine capillaries, which, by their great number and extreme minuteness, envelop, in the form of a vascular membrane, the ultimate or terminal ramifications of the excretory ducts of all glandular organs: for by the researches of Müller, Weber, Rathke, Kiernan, &c., into the intimate structure of the glands of adult animals, and those of Müller, Von Bär, and others, into the mode of embryonic development and growth of glands, the correctness of the opinion of Malpighi, Cruikshank, &c., is demonstrated, viz. that the greatest analogy exists between them and the most simple mucous crypt of the intestinal mucous membrane, or cuticular sebaceous follicle; that, in short, a gland is made up of innumerable cryptæ, which are ramifications of the excretory duct, each ultimate (and in most organs by aid of the microscope alone visible) branch of the excretory duct terminating by a blind extremity, in the parietes of which are distributed the finest capillaries, the secreting surface being covered with cells. These capillaries are many times smaller than the cryptæ, follicles, tubuli seminiferi, tubuli uriniferi, &c., as they are called, in different organs, and do not communicate with them by open or terminal extremities, as Ruysch and later anatomists have supposed; on the contrary, the finest capillaries are seen to join with one another, so as to form again larger and larger trunks, then called veins. Secretions, therefore, are vital transudations from the capillaries into the excretory tubes of the glands. Modern physiologists consider that the cells covering the secreting membrane are the immediate agents of the secretion, the operative parts of the process. Layers of these cells are successively formed, developed, or distended by secretion, into their interior, of fluids peculiar to each gland; the cells burst, dissolve away, or are cast off; their contents are poured out and flow into the ducts of the gland. This cell-formation appears admirably adapted for still greater multiplication of surface. We see here the wonderful contrivance by which an enormously large surface is obtained for the purposes of secretion: a gland being strictly comparable to a mucous membrane so convoluted upon itself as to occupy as little space as possible in the economy of animal bodies, having one or more outlets left (the excretory duct or ducts, or sum total of all the excretory tubes), by which the secretion is emptied into its proper receptacle. Not the least interesting point in our present knowledge of the structure of the glands, is the strict analogy shewn to exist between all glands and the lungs. Indeed, owing to the comparatively large size of the individual parts constituting the lungs, and, consequently, the facility with which their minute anatomy may be investigated, they may serve to illustrate, by analogy, the structure of the apparently more complicated, because with greater difficulty investigated, glands. The latter, as just stated, consist of an excretory duct or ducts, which subdivide, as if *ad infinitum*, first into tubes and branches of first, second, third, and fourth orders; and at last into clusters of the finest pouches or follicles, the parietes of which are enveloped in a net-work of capillaries. It is precisely the same with the lungs: composed of an analogue called the trachea, the branches of first, second, third, and fourth orders are the bronchial tubes, which at their ultimate terminations, after the most elaborate branching out, present clusters of minute cells, which represent the acini or clusters of minute cryptæ or follicles. The air-cells of the lungs have, like the glandular cryptæ, their beautiful net-work of capillaries, from which the hydrogen and carbon, or carbonic acid and water, are secreted, without there being any direct communication between them and the capillaries themselves. The lungs, however, are adapted for something more than a glandular purpose: they convey to the blood the material for aiding its purification, its secretion of carbon, &c.; for whether the atmospheric air carried into the lungs be merely a vehicle for carrying off, according to Lavoisier, Laplace, and Prout, carbon and hydrogen secreted from the blood; or in order to afford oxygen for absorption by the blood, to be subsequently secreted in the form of carbonic acid and water, as Sir Humphrey Davy and the majority of chemists suppose,—the peculiarity of the lung, besides its analogy with the glands, remains.* From the free anastomosis between all the capillaries in a secreting organ, and their gradually forming larger and larger vessels constituting veins, without any direct communication with the tubes, cryptæ, or follicles, into which the secretion takes place, being proved, so that whatever of the blood is not secreted is returned,—it does not follow, that where there is diminished secretion, there is obstruction; on the contrary, there may be more space for the flow, but then in a slower stream: for, as has been shewn, the consequence of enlargement of the capillaries of a part is, that the flow of blood will be slower in them, the supplying arteries remaining the same; the larger the capillaries supplied by these branches, the slower the current will be as in the skin, kidneys, serous membrane, salivary glands, &c. Hence, to account for the diminished secretion, it is not necessary to suppose either any "spasm," or "*error loci* of the red particles, getting into the colourless capillaries:" it is enough to consider, that the fluid finds an easier way, by the enlarged capillaries onwards into the veins, than into the ramifications or cœca of the excretory tubes, unfitted as the capillaries are for secretion, owing to the morbid alteration of their physical condition;"* and, besides, yet more particularly, through the alteration of their dynamic (galvanic or electrical) condition, consequent upon the alteration of the supply of nervous energy to the part, the original cause of all the disturbance. Local enlargement of capillaries explains that kind of diminished secretion where the heart is not deficient in injecting power; the relaxation of the capillaries, from want of nervous energy, producing a deficiency in the current of the blood; as in a dry skin when inflamed or feverish, or kidneys inflamed, or their capillaries enlarged by cantharides, so as to diminish secretion, in the manner just explained.

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* As all secretions are affected by the (galvanoid) agency of the nerves on the blood in a series of capillary tubes, it becomes an interesting object of physiological inquiry, how far the mere change of form in each glandular organ—merely by alteration of number and series of capillaries and nerves, as modelled on the ramifications of the excretory duct, the true element of the gland—produces secretions apparently so different, but, after all, differing only in the proportion of atoms of the four constituents, carbon, hydrogen, nitrogen, and oxygen, which are found in all, with a different proportion of the saline constituents of the blood appropriated to each.

In some cases of disease, when the secretions of the skin and kidneys are deficient, we renew them by bleeding, digitalis, antimony, &c., which lower the force of the pulse, thereby diminishing the distension of the capillaries, in conformity with the above statement. On the other hand, in health, stimulants, such as diluted fermented liquors, by increasing the nervous energy in the kidneys, &c., and quickening the circulation at the same time, increase secretion. Or, medicines such as uva ursi, digitalis, antimony, neutral salts, &c. have a local astringent effect when circulated, besides their influence on the pulse. Stimulants cannot increase secretion by quickening the circulation, when the capillaries are in a state of debility and morbid congestion; and a still farther proof that they are in a state of morbid congestion, is the effect of cold to the loins in such cases in renewing the secretion; and the constringing effect of cold water, even cool air, in promoting the secretion of insensible perspiration, and thereby softening the congested skin, in scarlatina. Increased secretion takes place sometimes with a weak pulse. It will be found that this occurs in cases where, although the circulation is weak, the capillaries are not congested, as in hysteria; in the sweating of hectic, and also in the sweating stage of ague, after the hot, dry, congested stage has passed off, analogous to what was stated above of the effect of cold in scarlatina. In these cases there is a deficiency of nervous influence, which, if the heart were acting strongly, would cause parts to flush; as we see, in fact, in the flushing alternations in hysteria, hectic, &c. But when the heart is not acting strongly, and there is a debilitated, anæmial, or flaccid state of an organ, the kidney for instance, which produces a limpid state of the secretion, this may be counteracted by giving either diffusible stimulus to increase the force of circulation, or local stimulus, such as turpentine, or a combination, as sp. junip. co. &c., which, when circulated to the kidney, by eliciting more nervous influence, will restore the organ to its natural dynamic state, and thus both diminish the morbid secretion and render it less limpid. As soon as the local stimulus of the turpentine becomes excessive, it gives pain in the back, and diminishes the secretion too much; affording an illustration of the circumstance that different doses of medicines produce most opposite effects.

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* It is evident that the cœca themselves must be narrowed by that congestion or enlargement of the net-work of capillaries surrounding them, which is produced by inflammatory relaxation, as is well known to take place in hepatitis, nephritis, &c. We can understand, too, that the tubes themselves may be thickened, until their calibre is obliterated by the internal swelling of their substance, as takes place in inflammation of the liver, &c.

The healthy operations of the arteries have been mentioned, as far as their continued and gradual deposition of matter in its various modifications from solid bone to gaseous exhalation. Their depositions are very gradual, in proportion to the whole quantity of blood passing through them, a great portion of which returns by the veins unchanged, or at least unconsumed; so that there is always an abundant overplus for the demands of the system, and this provides against accidental or artificial loss of blood.

Whilst the processes described go on, the animal suffers no inconvenience—is in health; but when accidental mechanical injury, or other cause, changes the action of the capillaries, either by a direct impression on themselves, or by primarily injuring their nerves, the derangement of their action is the commencement of disease—secretions become altered; checked, or profuse—nutrition is either diminished, so as to produce emaciation, or there is an excessive deposition—vapoury exhalations are diminished to dryness or increased to fluid—bony matter is deposited in wrong places, or albuminous, fatty, and other particles, so as to constitute tumours—the nerves of parts become morbidly sensible, so as to derange the functions of those parts—portions, on losing their vitality, undergo spontaneous decomposition, and are removed by the absorbents.

To explain this more in detail: every DISEASE is some *alteration* of those *actions* which, when perfect, constitute the *welfare* of the animal; and in some instances, by a provision of nature ("*vis medicatrix naturæ*"), the newly altered action, which is the consequence of the injury, leads to the reparation of the damage, without assistance from art. For instance, the tubes conducting the air through the lungs are, under ordinary circumstances, scarcely moist; but if particles of dust, or insects, be inspired, the resulting irritation causes morbid sensibility, is followed by the extra-production of mucus, entanglement of the foreign substance, and its evacuation by cough.

We also see that where a part is cut, the minute arteries conveying *coagulable lymph* allow the escape of a sufficiency of it to glue and unite the surfaces, if kept quietly in contact—called technically UNION by the FIRST INTENTION; and we know that, not merely a part partially severed will reunite, but even a piece wholly cut off, if small, and not depending on vessels of any size, will unite by the first intention; as the top of a finger or a thumb, including even a bit of the bone, which had been cut off by an artisan with a sharp tool, has been replaced and has reunited. This is analogous to the Hudibrastic version of the Taliacotian operation; but as opportunities of witnessing such circumstances are rare, some knowledge of physiology, and a reference to J. Hunter's experiments, are requisite to enable us to believe the fact.

When blood is allowed to stand in a vessel, the upper part of the clot which settles down from the serum, of a yellowish-white colour, affords a specimen of coagulable lymph, carried in readiness to repair damages.

Now, if the union by the first intention be prevented by disturbance, it becomes necessary that the surfaces should be reunited by the interposition of a new substance forming a connecting medium: for this purpose small drops of coagulable lymph are exuded, which concrete, remaining at the cut ends of the capillary arterial branches which have yielded them, and in communication with these open ends, so as to become organised and receive nourishment by the capillary growing longer, and continuing itself onwards into the lymph.* These little portions of coagulable lymph are called GRANULATIONS; and if they are not much disturbed, they adhere to each other, and thus the cementing of the divided part is effected, and even a considerable gap is sometimes filled up by granulations springing from granulations. This spongy mass gradually condenses, forming a firm bond of union, generally distinguishable, and is called CICATRIX. Wherever solution of continuity of the skin is not healed by the first intention, a visible cicatrix remains, as the newly formed solid has not the same degree of vascularity as the surrounding tissues. In order to protect the new tender granulations, they are covered with PUS; a creamy, thick fluid, which, when of a due consistency, is very properly called healthy pus, for it requires a healthy action of the capillaries to produce it in proper quantity and of due consistency. If pus did not defend the granulations from the air, they would dry and become scabs, instead of uniting and repairing the parts; if the secretion be too thin, so as to become ichor instead of pus, shewing a debility in the capillaries, we have, from that same cause, weak, spongy granulations, or even none at all are formed. An ulcer which, whilst healing, appears a large ugly sore to the inexperienced eye, is called by the surgeon a fine healthy granulating surface; and often, to obtain this healthy process, the exercise of much skill, both in local and constitutional remedies, is required; as, for instance, to heal an ulcer, a wound, a stump, or other part after operation. This is sufficient example of the necessity of a surgeon being well acquainted with the use of constitutional remedies; and the most dexterous, after performing an operation, may be glad of a knowledge of medicine to relieve subsequent constitutional symptoms.

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* J. Hunter speaks of the "vitality of the blood:" he saw that it had something in it analogous to that organisation which exists in the living solids; the microscopic study of histology has shewn this to be the fibrine, which makes the first step of organisation in every instance, by furnishing the material of the cells which are the rudiments of each new formation.

Many persons of great experience practise moderately well empirically without much brains or reasoning; but he who begins upon principle, and then profits by experience, must become a much more skilful practitioner. How many persons apply a poultice to an ulcer with a tolerable certainty of improving it, without ever knowing or caring for the rationale of the effect!

By studying the operations of nature we are led to imitate by analogy. Independently of the regulation of temperature, the usual benefit derived from a POULTICE is that of preventing premature scabbing, by the soft moisture assisting the pus to protect the granullations. The German WATER-DRESSING has much the advantage over a poultice: the piece of lint dipped in water is lighter than the poultice; the oiled silk over all retains the moisture; and the whole does not spoil the sound skin, as the poultice often does. If poultices be too long applied, PROUD FLESH will form, either from a superfluous growth of healthy granulations, or of such as are weak and spongy. Exuberant unhealthy granulations may be checked by applying an ASTRINGENT, such as nitrate of silver, or sulphate of copper, &c., which, by constringing the vessels, gives a firmer, smaller granulation; healthy redundant granulations, by vinegar, which dissolves them; or in either case merely laying on a piece of DRY LINT, to absorb the coagulable lymph as fast as thrown out, will restrain granulation. This accounts for dry lint preventing the healing of some ulcers, and assisting others, according as the granulations require repressing or not; and what has been here stated affords an explanation why in some cases dressings should be changed frequently, in others as seldom as possible. Baynton's strapping unites the advantages of keeping the granulations moist, with SUP-

PORT; but if injudiciously applied, injury is done by the pressure. Weakened vessels want support, but cannot bear pressure.

I have above used the term *premature* scabbing, because the crust formed is sometimes of use; as, in the natural process of healing of an ulcer or abrasion, the crust sets bounds to the granulations, which otherwise might sprout too high.

The application of dry lint will be enough, without an astringent, if the proud flesh be merely too great a growth of healthy granulations; but if the granulations are also weak, the astringent will be necessary in addition: this weakness may be known by a livid colour, and thin, instead of creamy pus; and if still weaker, the granulations will even melt away, and the sore reulcerate. Now, an inexperienced person would suppose that the application of nitrate of silver (lunar caustic), or sulphate of copper, would increase the pain; but it is well known that, though they produce momentary smarting, especially if applied undiluted, this soon subsides; so that a patient will fall asleep shortly after the application of nitrate of silver to an ulcer, which had banished rest for several days and nights by its morbid sensibility. The beneficial effect may be thus explained:—the nerves of the part having become inflamed, and their vessels partaking of the debility of those in the surrounding tissues, the astringent diminishes the inflammation in the nerves, and thus removes their morbid sensibility, bringing them to the state of the nerves in a healthy granulating part, in which those below the granulations are sensitive, but not more so than natural. Oil of turpentine applied to a burn acts on the same principle of bringing the nerves to the state of those in a healthy part, not merely by astringency, but also by eliciting more nervous influence in a part whose vital power is depressed (p. 43).

This will aptly illustrate the nature of MORBID SENSIBILITY, usually designated by the vague term IRRITATION. It does not occur during the REPARATORY PROCESS ("healthy inflammation"*), the nerves not being inflamed; but "morbid" inflammation (as it is called when the reparatory process is interrupted) involves the nerves.

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* Formerly I have sometimes used the term *healthy inflammation* as synonymous with *reparatory process*, in compliance with custom; but it is wrong: inflammation under all circumstances is *disease*, being, in fact, the injured state which precedes the reparatory process.

A considerable degree of pain may exist during even the healthy reparation of injury, when the healthy nerves are exposed and hurt; but there will be more disturbance and loss of sleep, with perhaps less pain, if, from the nerves themselves becoming inflamed,* morbid sensibility arises, either locally, or in the nervous centres, in consequence of the lesion of the nerve being communicated to them, whether the lesion be in the sensitive or organic filaments: in the latter case, there can be no evidence of morbid sensibility until the lesion is propagated to the nervous centre; as in tetanus, arising after a cut has healed almost by the first intention, without pain in the cicatrix; or convulsions from worms in the intestines, which have caused no pain.

By a process analogous to granulation (see p. 51), coagulable lymph, exuded in consequence of inflammation between SEROUS MEMBRANES, sometimes becomes organised, and forms ADHESIONS.

In MUCOUS MEMBRANE the change is very rapid from health to disease: by a slight alteration of the action of the capillary arteries, which secrete a vapour or mild fluid to lubricate and protect the surface, it becomes either dry, or a thin saline fluid is poured out, which, so far from protecting the parts, irritates them and others with which it comes in contact. Again; after the mucous membrane has been throwing out the fluid just described as in (catarrh), the thickening of the discharge, and its becoming bland and opaque, yellowish-white, (in other words approaching to, and in some instances forming actual pus,) is the simple reparatory or restorative process; and we know that various mucous membranes, whilst inflamed,—the urethra, for instance,—throw out an ichorous fluid, which becomes true bland pus as the reparatory process proceeds; and it is the same with respect to the schneiderian membrane.

Thus, we see, we can have both coagulable lymph and pus, without ulceration. Sometimes coagulable lymph oozes from the capillaries of mucous surfaces, and concretes, forming what are called FALSE MEMBRANES, as in croup. Similar formations are also sometimes passed from the bowels, which have been mistaken for a separation of the lining membrane. They are of a tubular form, different from the long vermiform evacuations of merely condensed mucus which are sometimes passed from them. Hunter has pointed out the close analogy between the throwing out of coagulable lymph in or after inflammation, and the first formation of the lining membrane of the gravid uterus and sometimes a similar false membrane forms even in the unimpregnated uterus, as occurs in cases both of dysmenorrhea and menorrhagia, besides those which form in the vagina, of a larger size and different shape. Thus the same coagulable lymph, so useful for the purpose of repairing damage or continuing the species, sometimes kills—as in croup, by blocking up the windpipe; or produces blindness, by rendering the cornea opaque; or glues the intestines to one another, after peritoneal inflammation. And we have not only these false membranes, as they are called, thrown out on serous surfaces, as the pleura, but also pus, without breach of surface. The operations of nature are uniform and simple,—the reparatory process is uniform and simple. The throwing out of the coagulable lymph, in these cases, is equivalent to its being thrown out to effect union by first intention, or granlations, though, from the locality (the cornea, windpipe, &c.), it becomes inconvenient, or even destructive.

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* I know no other term by which to express their lesion.

If by a blow or other injury, as by caustic, or by any inflammation, the *life of a portion be destroyed*, it gradually decomposes, and separates from the living part; sometimes in the form of a discoloured slough, the fluid parts running off when the slough is on the surface. The *separation* is effected by *decomposition*, and *not* by the *absorbents* of the living part removing a portion of the dead parts, as has been asserted: the part at the line of separation of a slough of the skin, for instance, decomposes most rapidly, from the heat and moisture of the surrounding living part; whereas the centre of the slough often dries up, like a piece of leather. Occasionally it happens that, from absence of moisture, the consequence of *gradual* extension of the mortification, the dead part, instead of decomposition, undergoes uniform desiccation, and the disease is technically termed *dry gangrene*. After the separation of a slough on the surface of the body, an open wound is left, which, if the reparatory process go on naturally, will be filled up by granulation, as already explained. If a smooth hard substance be laid in the wound (as a pea or bean, to keep open an issue), it prevents the formation of granulations; but as the reparatory process or effort nevertheless goes on, pus is still secreted from the capillaries, and as soon as the hard substance is taken away, the formation of granulations will commence. Here, again, we must not confound the reparatory process with inflammation: a properly managed issue is not in a state of inflammation; on the contrary, it is well known that if it become inflamed, the pea must be taken out for a while to ease it, or the part will become swelled, red, and painful; and either proud flesh will form round the margin, or ulceration take place.

ULCERATION is the death of successive layers or minute portions of an open wound, of whatever dimensions, the solution of continuity having been effected either by spontaneous inflammation and decomposition, or by external injury; and the matter which successively dies in an ulcer is not separated from the living part nor taken away by the absorbents, as has been generally asserted, but decomposes and dissolves away. Again; an ulcer is not necessarily in a state of inflammation; for, on the contrary, whilst healing, it is in a state of reparation; and any renewal of inflammation causes enlargement—*fresh* ulceration. There is a little apparent contradiction in this statement, from the word ulcer (*ulcus*) signifying simply an open wound which has been formed by other means, as well as by the process of ulceration, or ulcerating inflammation; but I repeat that, though the diseased process of ulcerating is ulcerative inflammation, yet in the resulting wound when once formed there is not necessarily inflammation any longer existing; and it is, on the contrary, by carefully warding off inflammation that the surgeon cures it.

An ULCER, therefore, is *not* necessarily in a state of *inflammation;* it is the *space left* by the destruction of a part by mechanical or chemical injury, or by inflammation: but if the constitution be in a natural state, and the ulcer not influenced by any morbid poison, it goes on granulating and healing. If, instead, inflammation be renewed in it, each renewal may cause fresh loss of substance, and the ulcer become what is called phagedenic.

When the whole part, killed by external agency or inflammation, separates at once, instead of gradually dissolving away, it is called a SLOUGH; and if this slough takes place by spontaneous inflammation, it is called GANGRENE, SPHACELUS, OR MORTIFICATION. A slough may be produced by caustic, then called an ESCHAR; or by chemical poisons, as I have seen the whole lining of the œsophagus slough away at once in a patient who had swallowed nitric acid.

When I say that the absorbents do not effect the separation of a slough, I do not deny that they may, and do, nevertheless take up some of the decomposed matter ; for we know that on the death of a part which is not superficial, and when, as under the skin, the dead matter, being confined, cannot run off, the absorbents will often by degrees convey it all away ; but in the case of a caustic eschar, as of a gangrenous slough, it is decomposition, not the absorbents, which effects the separation. When any injury, as from a blow, or inflammation, is sufficient to cause death of a portion deeper seated below the skin, the decomposed matter may be carried off by the absorbents and (venous) capillaries, as we see in the case of an ecchymosis of extravasated blood ; but in general, the reparatory process causing the secretion of pus, suppuration, an ABSCESS, takes place. It is sometimes incorrectly said that, when inflammation exists, it is of consequence to prevent suppuration. Now, what is to be prevented is, the death of any portion ; if that take place, the suppuration is merely a matter of course, as a part of the reparatory process. After what I have stated, it is scarcely necessary to add, that I do not admit of the explanation, of pus being formed by the mechanical or chemical breaking down and liquefying of coagulable lymph, as asserted by Laennec, in speaking of empyema ; nor the explanations of Dupuytren and others, of part of the sloughs of abscesses dissolving into pus.*

The cavity of an abscess is lined more or less with coagulable lymph, analogous to the granulations and false membranes and adhesions above spoken of. This CYST, as it is called, or the abscess is merely the cellular tissue of the part stretched upon the contained pus, and which does not set bounds to the abscess, but passively depends upon the quantity effused into it. When the inflammation is diffused or ramifies, we have diffused or ramified abscess, as from DIFFUSED CELLULAR INFLAMMATION.

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* I pointed out (p. 52) that the formation of pus is a vital process, a secretion. This has been since confirmed by Vogel and others, who have proved, by microscopic observations, that pus results by the development of pus-cells from the more solid parts of the plastic lymph, and the liberation of the more fluid part, the *liquor puris*. When pus is set at rest, the pus corpuscles constitute the sedimentary matter, the liquor puris the supernatant fluid. In treatment of inflammation, we seek to diminish the intensity of the process, and to prevent so great injury to the texture as may end in death of the parts.

Though it has been stated by high authority, that "inflammation is the means by which local injuries are repaired, and may be considered as the restorative principle," I contend that it is no such thing; but a state of disease; or else, why speak of remedies for it? And, indeed, in applying them, it is of great consequence to know when to stop; for the period of inflammation is often very short; and unless the practitioner knows when it has ceased, he may do much mischief by interfering with the natural reparatory process. The period of inflammation of the pleura or peritoneum is often so brief, that even destruction of tissue of which a patient will inevitably die may have been effected, though the inflammation had not lasted above three or four hours, as we see occasionally in peritonitis and pleurisy, whether idiopathic or traumatic.

For example; a youth, after being exposed to severe cold, was conscious, for a few hours only, of sharp pain in the abdomen, but became feverish, with sickness and constipation. He did not apply for advice for two or three days, at which time he made no complaint of pain in the abdomen even upon moderate pressure, except across the hypochondria, where pressure produced some uneasiness. He died in about a fortnight, though judiciously treated for peritonitis by his medical attendant. On examination, all the intestines were found glued together by coagulable lymph, and some pus was effused in the cavity of the abdomen.

The practitioner will do harm if he does not withhold or relax antiphlogistic treatment (not only bleeding, but such medicines as tartar emetic, purgatives, digitalis, colchicum, &c.) as soon as inflammation is subdued. I have seen a patient in pleurisy, with extensive pleuritic effusion in one side, whose life had been saved by active and judicious bleeding, and other antiphlogistic means; but who afterwards nearly sunk in consequence of the medical attendants persevering with purgative and other antiphlogistic medicines after the inflammation was quite subdued. This they did on account of that uneasiness in the parts which was only extra sensibility (tenderness, as in a bruised part), in consequence of the lesion produced by the severe inflammation, and which uneasiness naturally remained in a certain degree even for months afterwards.

Through neglect of attention to this circumstance, I have formerly witnessed patients suffering from the pleuritis, which often attends upon fractured ribs, *fatally* exhausted by repeated blood-letting. Surgeons in those days knew less of medicine than is requisite even to treat a fractured rib, and confounding the morbid sensibility of the injured part and neighbouring pleura with inflammation, they bled the patient at each visit, until he died. The first or second venæsection only was probably demanded by the actual condition of parts.

On the other hand, in many protracted cases of disease, when the patient feels scarcely ill enough to apply for medical advice, we find some latent inflammation, requiring active and decided antiphlogistic treatment, which may surprise the patient, but of which he soon feels the benefit.

A distinguished writer on inflammation asserts, that the "adhesive inflammation which precedes the act of ulcerative absorption obliterates the vessels," so that there is no escape of blood. This, as an enumeration of phenomena, is true, but is no more than a mode of stating the phases: as a rationale of the process, it is incorrect; there is no such thing as adhesive *inflammation*—the inflammation is that which destroys the life of the part, whereupon the separation of the dead portion takes place; which has been erroneously attributed to the absorbents. The reparatory (adhesive) process, which is intermediate, by its lymph stops the vessels, so as to prevent hæmorrhage, and subsequently produces granulation and suppuration, as before explained. In fact, the succession of events is as follows: *inflammation*, death of part; *reparatory* (*adhesive*) *process*, effusion of lymph closing vessels; then *ulceration*, decomposition and separation of dead parts. Thus I can account for bone, tendon, cellular tissue, and other parts, dying and gradually coming away dissolved, or in shreds and fragments; but the explanation of their removal by the absorbents, nibbing them across, as it were, is neither intelligible nor credible. Again; the term ulceration is used by authors most contradictorily; as, for instance, besides its true meaning of eroding, we have the expression "the process of ulceration,* by which the surface is restored:" this anomaly arises from the misuse of the term (healthy) inflammation.

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* It ought to be, granulation.

When a part receives a blow of a certain force, there is an extravasation of blood from the capillary arteries, or an effusion of lymph, which causes swelling of the part. In this instance healthy capillaries are compelled by force to allow their contents to escape, which are afterwards gradually removed by the absorbents. In disease the process is similar; in erysipelas, the capillaries being damaged, lymph and serum are effused, causing swelling, which are re-absorbed as the patient recovers: in dropsy nearly the same takes place.

By savine or cantharides ointment we can produce an inflammation—such a relaxation and debility of the capillaries of a part, that they break away from the adjacent sound parts, by which means warts are thrown off; and this, as regards the mode of separation, is analogous to the rising of the cauticle from a common blister. These phenomena have usually been wrongly attributed to the savine and cantharides producing "a higher degree of action of the vessels than the parts could bear," which is altogether irreconcilable with the true physiology of vascular action (see p. 30 et seq.) The inflamed surface pours out serum or lymph, by which the sound or warty cuticle, as the case may be, is detached. The tuft of capillaries springing from the cutis, and which forms the basis of the wart, is often destroyed at the same time by the inflammatory process,—by ulceration. The inflammation attacks and destroys the vitality of the papillæ of the skin on which the wart is formed, agreeably to what is a law in the animal economy, that parts newly added to the economy, organised deposits, hypertrophied parts, as enlarged cutaneous papillæ, cicatrices, are destroyed by the same amount of inflammation that would leave an original part intact.

The cicatrix after a wart, resembling the cicatrix of a pit of small-pox, is sometimes permanently visible, but not always so; as the cicatrix of a small-pox is sometimes not a permanent mark, or, in other words, small-pox does not always pit. The reason of this is, that the small-pox vesicle does not always suppurate, though it has incorrectly received the name of pustule: it is at first only a vesicle filled with serous fluid, which is subsequently converted into a pustule. The superficial nature, or, on the contrary, the depth and thickness of the cicatrix, depend upon the previous loss of substance on the part of the dermis or true skin. The separation of a wart may, or may not, be accompanied by ulceration of the surface from which the wart has been detached. In small-pox also, the maturation of the eruption, which is at first vesicular, consists in effusion of coagulable lymph and secretion of pus by which the vesicle is enlarged, and through the change of its contents, is said to be transformed into a pustule. This transformation may, or may not, be accompanied by ulceration of the dermis. In confluent small-pox, ulceration of the bases of the pustules does occur, hence the subsequent pits upon cicatrization; in some parts, as the face, when several pustules run together, sloughing as well as ulceration ensues, from which originate the unsightly seams often perceptible. True pus is not formed, except on the surface of membranes, unless the inflammation has been sufficiently great to cause that lesion of the capillaries which requires effusion of lymph and pus for their cure, equivalent to granulation and suppuration; but, of course, when this takes place in a mucous membrane, the moisture, or substances passing along, in general prevents the granulating lymph from remaining or forming a coating; so that we seldom see false membrane on mucous surfaces, the pus only being perceived. Fortunately true croup, or that accompanied with plastic exudation, is comparatively a rare disease; but I have known false membrane form even in the urethra—at least small tubular shreds of coagulable lymph, which I judged to be such. Again: we have, after the same degree of lesion, the restorative process sometimes throwing out lymph, equivalent to granulation, or rather to union by the first intention, without pus; as may frequently be seen upon the surface of the rete mucosum, the lymph immediately drying into cuticle, after a slight abrasion, or a common blister, when the cuticle is often restored without suppuration; but sometimes the skin is injured, and pus is formed during the necessary process of repair. Sometimes, after a blister, even when the skin is not injured enough to require suppuration, we see a superfluous quantity of the lymph which forms cuticle thrown out with the appearance of jelly.

The small-pox eruption, as just mentioned, is only a vesicle, though a reticulated one, being an aggregate of minute vesicles formed in succession, precisely like the vaccine. The vaccine always in the end pits, as there is loss of substance of the rete mucosum, owing to the intensity of the inflammation; but the chicken pox, which is a more simple vesicle, and of shorter duration, rarely pits. The cause of the peculiar depression in the centre of the vaccine and small-pox vesicles whilst the eruption is at its height is this: each eruption first forms in a point, and that point, having gone through its inflammation before those that follow around it, is elevated on a smaller scale, and its coagulable lymph begins to dry up whilst the circumference is fresh and swollen. I have heard the vaccine central dark spot attributed to the cicatrix of the lancet-puncture, and the variolous spot to the binding down by a sebaceous duct: but the lancet-puncture heals by first intention, before the specific inflammation begins; and there are many more than one sebaceous duct in the space of either a vaccine or variolous vesicle.

The effect of inflammation, as is evident from its proximate cause (relaxation of capillaries), is to SOFTEN the tissue in which it takes place. An inflamed part may feel hard on account of tension; but when cut into, the inflamed tissue will be found softened.

Inflammation as hitherto considered is what is called ACUTE, wherein either *resolution* or *destruction* of *parts* soon takes place—*cita mors venit, aut victoria læta.* CHRONIC inflammation is that in which the cause of the inflammation remains, producing reiterated lesion, followed by continual efforts of the reparatory process in depositing coagulable lymph, which sometimes becomes organised and produces actual hardness, as in strumous and other tumours, syphilitic nodes and warts, chronic hepatitis, &c.; sometimes a persisting open ulcer, as a chancre, in which the reparatory process goes on, and by depositing lymph thickens the edges, whilst the continued inflammation keeps the ulcer open by the successive death of minute portions; or, if it be not strong enough to produce death of portions, so as to keep the part in a state of open ulcer, it still renews enough of inflammation to prevent healing—that is, the organisation of the cicatrix, which therefore becomes a scab—sometimes single, constituting a scale, as in the coppery eruption; sometimes in successive layers, as in rupia; sometimes in clusters after pustules, as on the face.

A morbid poison not only inflicts the injury, but, by adhering in the tissue or constitution, perpetuates it till exhausted or expelled by some remedy. Thus a most minute portion of small-pox virus, on the point of a needle, produces an inflammation similar to that from which it was taken. What is this inflammation but the effect of chemical or organic decomposition, as produced by cantharides, or the bite or sting of an insect or reptile? This virus may be absorbed and circulated, as has been hitherto supposed; or it may produce its effect by some chemical, and consequently electric or galvanic action, positive or negative, on the nervous tissue, constituting a morbid sensibility, which is propagated to the whole system:—this is evinced by racking pains in the spinal cord, brain, epigastrium, languor, convulsions, &c. &c., with disturbance of all the functions. Cantharides on a large surface, or in over dose internally, will produce similar feverish symptoms.

All this passes off, we know, in a definite time. So end small-pox, measles, scarlatina, typhus, plague, synocha petechialis, and others, the poisons of which are either communicated by contact or carried through the air to the lungs. Lues is different. Its destructive decomposition is of a different kind—of a slower, more permanent nature. As the acetuous fermentation is less violent, though more permanent, than the vinous, so the syphilitic decomposition (inflammation) is gradual, but steadily pervades the system if unchecked by remedies.*

I cannot help here hazarding a speculation upon hydrophobia; namely, that it is produced by a virus which poisons the nerves it reaches, takes a considerable time to contaminate the rest of the nervous system, and will eventually be remedied by some medicine which conquers neuritis—perhaps arsenic—perhaps some narcotic. My own inclination would be to try as much arsenic as the constitution would bear, combined with plenty of opium, which always enables the patient to take more arsenic than he could without it. I have found this to be the case in old cases of ague and of dysentery, which I have cured by the combination; indeed, it is also proved by the efficacy of opium as an antidote to arsenic.†

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* In these instances it is not the blood which is diseased, as assumed by the humoral pathologists. The blood only carries the virus, which is generated by the diseased local action. We can see by the microscope that the virus of the discharges of different diseases consists of particles of different shape and size, enough to account for a different and specific decomposition produced by each of them in the parts with which they come in contact; and the corpuscles in the lymph thrown out, being of different shape and size from those of healthy granulation and pus, partly explains the non-healing of such unhealthy, if not malignant sores.

† It is not very uncommon, on patients being brought to the hospital in conse-

We have not yet obtained a constitutional cure for cancer; but, aided by the investigations of Kiernan, Müller, Ure, Quekett, Vogel, and other pathologists, I think we shall arrive at it. We have also still to seek the remedy for tubercles; for, notwithstanding the exertions of Andral, Carswell, Louis, &c., we have not yet arrived at their true pathology. The treatment of tubercles which I have hitherto found most useful is that adapted to scrofula.*

Sometimes TUMOURS are formed in consequence of blows, coagulable lymph being effused, and by the process already described, analogous to granulation, becoming vascular and organised (possessed of vitality), not removable by the absorbents, which only take up unorganised, or in other words, dead matter. Some of these tumours remain unaltered; others by their presence keep up an inflammation, in consequence of which the capillaries deposit more and more by necessarily reiterated reparatory efforts. The tumour is thereby increased, until removed by remedies or operation, or it exhaust the animal and destroy life. Now, that which arises here in consequence of accidental injury, sometimes also takes place as the effect of disease, viz. tumours form spontaneously, either with or without feverish accompaniment, and sometimes disappear by what is called *resolution*, that is, cessation of the inflammation, and subsequent re-absorption. At one time they suppurate; sometimes remain indolent, or, on the contrary, they enlarge; at other times grow larger and ulcerate at the same time, as in cancerous and other malignant diseases. Tumours are modified by the part they occupy, and by the constitution of the person. If the substance injured be

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quence of having taken poison, to find that, thinking to make assurance doubly sure by taking arsenic and laudanum together, they have saved their lives. In an experience of many years, I have always found these cases do best; and many patients who had taken arsenic (arsenious acid) we have recovered by laudanum and calcined magnesia freely administered; making use, according to circumstances, of the stomach-pump, leeches, and other means not necessary to be enumerated here. The pain, (morbid sensibility), independent of inflammation, would kill, if not relieved by opium, as I have spoken of elsewhere in the instance of gout in the stomach. I must add here, for students, that gout of the stomach is almost wholly neuritis; but that in poisoning by arsenic there is, besides neuritis, considerable inflammation of the capillaries of the membrane.

* I shall add some observations, farther on, upon both the pathology and treatment of tubercular phthisis.

fat, the arteries there, being depositions of fat make a fatty tumour; if it be periosteum, an ossific; and if ahigh ly vascular part, a vascular tumour. The tough bands which traverse fatty and other tumours are constituted by arteries, which, in a healthy state, would have to support membranous, cellular or ligamentous tissues. A tumour of a lymphatic gland or other part, in that debilitated, relaxed constitution called STRUMOUS, or SCROFULOUS, will become so; and in a CANCEROUS constitution tainted by disease, cancerous tumours will form in any and every part. The same may be said of of tubercular disease, which differs considerably from common inflammation.

The same process which repairs, if induced morbidly, produces diseased growths, such as bony tumours from syphilitic or other inflammation of the membranes of the bones. During toothache from caries, the injured part, the tooth itself, being destitute of membrane, cannot be repaired; hence the inflammation excited in the neighbouring previously sound part, the lining membrane of the socket, produces no repair of the mischief, but only a useless deposit, as we see sometimes evinced by morbid growth at the point of the root, so that the tooth must be removed altogether. The arteries of the periosteum are always ready to deposit bone; whenever, from accident or disease, its vessels become imperfect, and the part spongy, as in nodes, *there is then sufficient retardation of the blood to allow of precipitation of bony matter.* The arteries cease to deposit when the spaces made by accident or disease are filled; if there be not enough of bone deposited to unite a broken limb, or if the consolidation has been prevented by motion of the parts, the surgeon often rubs the broken ends against each other, not for any effect upon the bone, but the real use of this expedient is to produce fresh laceration of the soft parts, so as to allow of renewed deposition of bony matter, and to make fresh spaces for its reception. Here although inflammation be excited, as a necessary consequence of the violence resorted to, and although it has usually been said that the intention was to produce inflammation, yet it would be all the better if the space for fresh callus could be made without inflammation. In fact, it is well known that the formation of callus in a fractured limb is retarded by inflammation, so that leeches and other means are used to moderate it.

If the absorbents cannot take up matter which is organised, it may be asked how they remove tumours?—The organisation of a tumour is but imperfect, and it is a burden on the previously existing arteries, in addition to their originally allotted task: if these arteries have been enlarged in size (for we know arteries can grow larger) in consequence of the inflammation which gave rise to the tumour, they will go on to support it; at other times, and most frequently, when the inflammation subsides, they resume their natural size, and starve the tumour, the constituents of which will, when thus deprived of support, become unorganised, and thus amenable to the absorbents: on the other hand, the tumour may have been too well organised to give way, and so continue a comparatively *indolent* life, after all inflammation has subsided, but producing neither pain nor inconvenience, unless a blow or other cause renew inflammation. Now, if the efforts of nature do not remove the tumour, we may diminish it by the following remedial means.

The simplest remedy is pressure upon the part, by which nourishment is prevented from entering its vessels,* as when a piece of sheet-lead or Arnott's air-bag is bound upon it, &c. Pressure should at first be so gentle as *not* to *compress*, but merely sufficient, by affording *support* to inflamed and distended vessels, to stop the inflammation; after which, stronger pressure may be resorted to without producing pain.

Cold, which will cause vessels to shrink, as cold lotions constantly applied, where pressure could not be borne on account of its producing pain.

Daily, or at least often-repeated, abstraction of blood by leeches, &c. from the part, with care not to undermine the constitution by taking too much.

Artificial discharge, with counter-irritation, as by issues, blisters, the tartar emetic, and iodine ointments, &c.

Medicines, such as mercury, iodine, &c., which have either a direct effect on the arteries themselves, or act indirectly through their nerves, so as to make the inflamed capillaries contract independently of the *vis a tergo* (state of the heart's action), or of the quantity of circulating fluid. This contraction of capillaries is necessary even when the circulation is very weak; for in some cases inflammation co-exists with a most debilitated constitution and weak pulse:* it is only the debility approaching to a dying state that will prevent a blister from rising, when the poison of cantharides has relaxed the vessels: hence it is plain, that an enormous loss of blood would be requisite to prevent a blister from rising; which shews that the proximate cause of inflammation is in the vessels of the part, and not in the injecting force (" vis a tergo"), nor in the total quantity of blood contained in the system (" plethora"). This will explain to the beginner, who has seen how much venesection has relieved inflammation from fractured ribs, that he cannot always " knock down"† inflammation by venesection alone; though free venesection in the beginning is of the utmost consequence. For, on the contrary, though the copious bleedings at first relieve the patient at the period when he can scarcely draw his breath, yet subsequently, pain, and even difficulty of breathing, will return, which cannot be relieved by repetitions of the bleeding, even if that were not inadmissible from the danger of sinking by loss of blood; and when pain and dyspnœa are urgent, we must try what can be done with antimony, ipecacuanha, mercury, opium, digitalis, &c., varied and modified according as there are more or fewer accompanying febrile symptoms. I should say, that it is seldom necessary to abstract to the amount of five or six pints of blood within as many

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* It is by this manner of operation, of pressure, that a tooth may be made to change its place, as when children's teeth are set even by the dentist, and which has been asserted to be directly effected by the absorbents. The pressure of the tooth on the vessels on one side of the socket disorganises it; the absorbents may then take up the inorganic particles, and the vessels on the other side of the socket fill up the space left (see p. 29.)

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* This is by some called passive inflammation, in contradistinction to that which occurs in a strong constitution; but *inflammation* is always the *same debility* of capillaries. Let us call things by their own names, and speak of the active or passive state of the constitution as indicating remedies.

† I consider the opinion wrong which Dr. M. Hall gives in allusion to certain cases of inflammation from accidents which terminated fatally under the treatment of practitioners. He says that, had they been real inflammation they would have borne the depletion (see his lecture, *Lancet*, Nov. 4, 1837, p. 186). Now I think they would not; for I am convinced that, where cases of inflammation, whether idiopathic or from accident, will not yield to bleeding, within rational bounds, assisted by antiphlogistic medicines, they must terminate fatally, either by the violence of the disease, or by the unavoidable extent of the depletion. I must also observe, that though he, being experienced, may know when to stop, I should fear his pupils might be led, in pleurisy, &c., to carry bleeding to dangerous lengths; as I was once called to see a medical pupil just before his dissolution, who, after hearing the lecture of a popular teacher on the subject of " knocking down" enteritis by depletion, had made his fellow-student bleed him till he sank never to rise. Dr. Hall says his medical friend (one of the cases he there alludes to—pleuritic inflammation produced by fractured ribs) lost about eight pints of blood within four days; and yet he declares that had it been pleurisy, he might have lost twice as much with impunity and safety. I think, however, no man could lose fifteen or sixteen pints (two gallons) of blood in three or four days with " impunity and safety." This is what he calls establishing a distinction between irritation and inflammation; truly, it is a strongly marked distinction—without a difference; for it was, in fact, a "mixed case." With respect to the man who died of fractured ribs with wounded

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lung, in Bartholomew's hospital, quoted by him, I must express an opinion contrary to that of Dr. Hall, who brings forward the case as one of irritation, in which the man died of exhaustion from a degree of bleeding which he could have borne had the case been inflammation. I cannot acknowledge the "distinction," here made, between inflammation and irritation, as I consider inflammation of the pleura or lungs, though produced by broken ribs, still genuine inflammation, and not irritation, or what I call morbid sensibility. By the second case alluded to at page 59, I have shewn when inflammation abates, and irritation (morbid sensibility) predominates. But because the last bleeding in the case of traumatic pleurisy just noticed accelerated the fatal termination, Dr. Hall seems to doubt the necessity for free venesection in similar ones; as if they had been cases of "irritation" from the commencement, whereas serious inflammation existed. Indeed, he says (*Principles of Theory and Practice*, 1837, p. 355), "cases of fractured ribs do not bear the loss of blood like those of inflammation." Of course the mere fractured bones do not *require* it; but I contend, on the contrary, that pleurisy from broken ribs requires the same antiphlogistic treatment as idiopathic pleurisy; at the same time making due allowance for inflammation or morbid sensibility being kept up by mechanical irritation, as by fractures elsewhere. I formerly witnessed much surgical practice, and I have seen patients certainly sometimes bled too freely for traumatic pleurisy; but I have known the same error committed in medical cases of idiopathic pleurisy. This, however, was not from ignorance of "diagnosis" in either; it was from want of knowing how much the powers of the constitution could bear; there was inflammation in all the cases, and "irritation" also. Much as I approve of what he has written on the physiology and pathology of the nervous system, on the "mimoses," "reflex function," &c., I cannot tolerate his perversion of the term "diagnosis," "by blood-letting;" for, notwithstanding the one sentence in italics placed to meet anticipated objections, that expression is calculated to puzzle, if not mislead, his junior readers. Diagnosis has always been understood to mean the distinction made between diseases for the very necessary purpose of arranging the treatment. In my opinion, before such a decided step as bleeding is adopted, the physician ought to have made up his mind as to what is the nature of the disease (the diagnosis). In the previous editions of this work I have adduced examples (which will appear in their proper places) of pure "irritation," that do not bear, or rather are not benefited by, depletion.

days, if active medicinal treatment be adopted to coincide with the bleeding.

We see that, applied to the surface, solutions of metalic salts, such as nitrate of silver, tartarized antimony, acetate of lead, bichloride of mercury, &c., and of many vegetables, such as mezereon, &c. act on the capillaries as astringents; but each of these, when too strong, produces a contrary effect, viz. inflammation and relaxation. We know that substances applied to the surface of the primæ viæ, or skin, are absorbed and carried into the circulation; and we judge that in this way these metallic salts, oxydes, &c. are carried to the capillaries of diseased parts, so as to act as astringents, and strengthen and cure. We know too that they are adapted to different cases. Antimony, which produces sickness and lowers the pulse, *besides its local effect on the capillaries, when it reaches them through the circulation*, is suited to, and resorted to in, acute diseases, such as inflammatory fevers, whether idiopathic or from injuries. Thus, we can account for the efficacy of antimony in such a case as scarlatina, by its diminishing inflammation in the superficial capillaries of the skin, fauces, &c., which have been relaxed by the morbid poison, and at the same time by reducing the power of the circulation when it is too strong, if administered so as to produce slight sickness or nausea: or if there be a low state of fever not requiring reduction of the pulse, the antimony may be given in small repeated doses, so as to circulate to the capillaries without depressing the pulse. Mercury, which has not this nauseating property, acts less on the pulse than antimony, but perhaps even more upon the capillaries, when circulated to them; hence it is oftener used in chronic cases, both syphilitic and others, besides being much employed in acute inflammation, pleurisy, peripneumony, peritonitis, &c. This affords a *rationale* of these remedies curing inflammations where there is no indication for depletory or common antiphlogistic means; for which mode of cure the vague term, "equalising the circulation," has been adopted; but it is erroneous, as the circulation cannot be unequal: it may be irregular, stronger or weaker, quicker or slower; but in either case the blood must be sent or circulated equally to every part of the body, as it passes at first from the heart through a single canal, the aorta; as stated when speaking of what has been called *determination of blood* (p. 45).

We are by no means to draw the conclusion, that an affection is not inflammatory, merely because it does not yield to depletion. What degree of depletion would remove a node, or syphilitic iritis, without mercurial or other medicine? What would venesection do for rheumatic pains, without antimony, colchicum, opium, bark, mercury, and other medicines?

But, even granting that syphilis or ague might be cured by low diet, abstraction of blood, and other general means, and supposing itch were curable thus (which it is not), instead of by sulphur; the question is not so much as to possibility, as expedition, and safety to the constitution: what degree of depletion would cure a rheumatism, which gives way to doses of colchicum too small to cause any sensible evacuation? just as small doses of arsenic will cure cutaneous inflammation, that could not be effected by bleeding or other depletion.

Mercury and iodine* remove morbid growths by starving them, which they effect by contracting the capillaries, and not by increasing absorption, as is a commonly received opinion. It may be said, that the swelling of the gums and fauces from mercury is a contradiction of this; but in many of our medical explanations we appear to "blow hot and cold." Mercury arrests inflammation in the same manner in one case that it produces it in another,—it contracts the capillaries; so that a healthy part is inflamed and even ulcerated by what contracts its nutrient capillaries beyond a natural state; an unhealthy ulcer is stopped by what contracts its relaxed capillaries *to* a natural state. *Contraction of the vessels*, however, does not express the immediate cause of the sponginess of the gums; there is, on the contrary, inflammation, *relaxation*, which is the *secondary* result of the contraction. The excessive contraction occasions the loss of contractility, that is, over-action causing at last a loss of power; as cold, which at first contracts, will at last destroy the power of the capillaries, so that relaxation, amounting to inflammation (chilblain), takes place upon the accession of even a moderate degree of warmth, even the natural heat of the blood returning into the benumbed parts. This will take place more certainly if the hands or feet be held to the fire, the common exciting cause of chilblain. If, on the contrary, the precaution were taken to wash the hands in cold water, and dry them without artificial heat, chilblain would often be escaped. The soreness* of the membrane of the mouth in incipient ptyalism is analogous to chilblain, the cold air, saliva, &c. acting upon a membrane whose vessels are in a state of extra contractility; moderate cold, when extra contractility exists, producing the effect of intense cold with ordinary contractility. Under these circumstances, when the mouth is kept closed, as during sleep, the natural temperature is too high for the capillaries. It is thus that we have, in the *rationale* of medical phenomena, to refer constantly to the variation of the proportions of the components of a sum,—*i. e.* the two things which contribute to a phenomenon. Thus a cold lotion may relieve a chilblain, which is inflammation produced by cold, and as cool air relieves ptyalism.

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* Iodine is very similar to mercury in its effects on the animal economy. The hydriodate of potash is a very manageable and good preparation of it. Like mercury, its effects are very variable on different constitutions. Some persons cannot bear much more than two or three grains of this salt three times a day without inconvenience. It produces a perception of fœtor, and sometimes soreness, in the mouth and fauces, and great languor. The mode in which it mostly disagrees is by irritating the stomach. Sometimes, the salt meeting with an acid in the stomach, the iodine is set free; and being acrid, irritates or inflames the membrane. I have been called in to two cases where, in imprudent doses, it had produced gastritis, like arsenic, but which were soon relieved by leeches and opiates. The bichloride of mercury or liq. arsenicalis, which are so useful in small doses, would do the same in excess. The abuse of a remedy is no argument against its use.

We see, in a variety of instances, that a remedial agent too long or too powerfully applied becomes noxious, by exhausting the vitality—in fact, wearing out or straining the machinery of the organ, so that it can no longer answer to the nervous influence, whether the organ be capillary tube or any other structure; and sometimes it remains for us still to investigate what part of the machinery has been injured—the contractile or the nervous tissue.

It was long before I could account for the so-called *specific* effects of such remedies as mercury, arsenic, or colchicum. We can understand thus far, that those membranes, areolar tissue, skin, and parts which are very vascular, under common inflammation run a rapid course of disease, and are relievable by active antiphlogistic means; but when parts are attacked by a *specific* inflammation, which is produced by a morbid poison, and which is slow in its progress, or when the tissue inflamed is one of dense structure with very minute capillaries, depletion, or taking off the *vis à tergo*, has little or no effect on those capillaries; and we are obliged to resort to what have been called *specific* medicines, such as mercury, arsenic, &c., which make them contract. Here we are supplied with analogies to help us in the prosecution of the cure of diseases with other remedies, in cases when the so-called specific either fails or disagrees; which being ascertained, the specific use of the medicine ceases—it ceases, in fact, to be a specific. For instance, at one time no remedy but mercury was employed in the treatment of the chronic inflammation produced by the syphilitic poison. Now according to my view of the proximate cause, we should deduce, *à priori*, that iodine might cure secondary syphilis; or that rigid diet, and such remedies as mezereon, would do so, by their effect on the capillaries; which have, in fact, been *empirically* proved to be successful. But it may be said, I have advanced no further than the empiricism: on the contrary, I have no doubt but arsenic would answer; but that, again, is not a fair example, as it is already used empirically in India; but iron would answer, only, not being so powerful, it would require the inconvenient adjunct of a rigid diet, as mezereon does. Again, I have no doubt that, on principle, colchicum might be substituted for mezereon; or antimony, silver or copper, for the other chemical remedies: gold has been tried, and found to succeed. But though it be useful to have other means, when we cannot employ the ordinary one, we need not resort to a hatchet or a penknife to cut bread, when a table knife is at hand; nor have recourse to any thing in preference to mercury for the cure of syphilis, from an apprehension that it may disagree, because in one in a thousand or a hundred cases it is found to do so. It is better to learn to modify it, by combining opium, &c. with it, to correct any inconvenience when it occurs; and when, of course, it is necessary to be able to bring analogical remedies into play.

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* There are persons, as is well known, whose mouths are so susceptible to mercury, that they cannot, in the ordinary way, take it long enough to cure the diseased capillaries in other parts.

The specific which puzzled me most and latest was sulphur for itch; but now the mystery is satisfactorily cleared, and we see why more powerful drugs taken internally could not cure it. The cause of itch consisting in a parasitic animalcule, it is easily removed by sulphur frictions, which kill the little animal in his lair; whereas it could not be hurt by the remedies that cure those eruptions that consist in a disordered state of the capillaries, and which are easily affected by the remedies as they circulate through them. Therefore, as there are other substances which can kill the animalcule, though perhaps none so conveniently as sulphur (corrosive sublimate, for instance, might salivate before it could cure the itch), one more specific is struck off our list. As for colchicum being a specific for gout or rheumatism, it is no such thing; there are several equally efficacious means of treating either. Again, there is no single specific for tic douloureux: cases have been cured with liq. arsenicalis, in which iron had failed, and *vice versa;* and I have cured a case with carbonate of iron, combined with galvanism, which I was told had held out against all the usual modes of treatment.* Tic douloureux may also be sometimes cured better by quinine, or opium with bark or quinine, than by any other medicine; sometimes mercury, &c. &c. are necessary. Bark is not the exclusive specific for ague; we can cure it with arsenic, and other remedies that cure neuralgia, and the neuroses in general, with which ague appears to have a strong affinity.

In addition to what was formerly stated on the subject, I may here observe, that *nervous influence* is engaged in producing *nervous actions*, such as perceptions or thoughts; *organic actions*, such as those of capillaries, heart, or intestines; and the *combination* of *nervous* and *organic action*—voluntary motion. If the expenditure exceed the supply of, or the generation by, the cineritious part of the nervous system, exhaustion is evinced in various ways: in health, by sleep; in disease, by delirium, stupor, or death. The warmth of fire produces a sensation first of pleasure, then, if increased, of pain: this elicitation of the nervous influence does no harm if the person be in health, because it is kept up by the apparatus of the brain and nervous system which generates it; but if the person be feverish, or the nervous system out of order, sitting close to the fire adds to the exhaustion and debility; nay, even in health, a lazy indulgence over the fire produces languor; and other indulgence of nervous sensation produces debility,

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* Carbonate of iron had, of course, been already employed to a large amount; but the disease was kept up evidently by a torpid state of the liver, which had resisted mercury and other medicines. The cautious repeated application of galvanism to the organ, in about a week produced an abundant secretion of good bile, and mproved the digestion; after which a perseverance with the iron for some time iured the neuralgia.

> "Balnea, vina, Venus corrumpunt corpora nostra," &c.*

To judge by the phenomena, alcohol produces sensation by calling forth nervous influence; its presence, like that of fire, exciting a quicker extrication of it. Here again, whilst there is health, so that the nervous influence is renewed, no harm is done; but, according to the constitution, the abuse of wine or spirit produces, sooner or later, an exhaustion, and the result is a feverish or irritable state, analogous to bodily fatigue, which is produced by expenditure of nervous influence in the successive discharge of it into the muscles, to keep up their action in walking or laborious exercise.

Sleep is a *cessation* of that expenditure of nervous influence which takes place in *nervous action*, such as volition, and other functions of the sensorium, *organic action continuing*. The expenditure of nervous influence going on, under ordinary circumstances, quicker than the generation of it, a periodical return of sleep is induced.

As the nervous influence is supplied to all the nerves in common, from the so-called nervous centres, the expenditure of nervous influence in one part usually lessens it in others. Fatigue from labour includes a certain exertion of the brain in the production of voluntary motion; but if the body and mind be fatigued simultaneously, as when a person has to walk much, the mind at the same time being anxiously occupied, the expenditure of the nervous influence will be more rapid, and the exhaustion greater. Again, the expenditure of nervous influence in intense study or professional business, especially if anxiety be combined, withdraws so much of it as to diminish the energy of the digestive organs; and in this way the cares of business become the fruitful source of indigestion and gout, particularly if, as in great cities, perpetual feasting add to the labours of the stomach.

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* Or according to an older version:

οἶνος καὶ τὰ λοετρὰ καὶ ἡ περὶ Κύπριν ἔρωη
ὀξυτέρην πέμπει τὴν ὁδὸν εἰς ᾽Αΐδην.

It is well known that digestion produces drowsiness and chilliness, by diminishing the energy of the brain, and by abstracting the nervous influence of the skin. And, reciprocally, digestion is promoted by the sleep thus produced, more nervous influence being allowed for digestion by the cessation of sensorial actions.

It is necessary here to notice the distinction between *stimulants*, *sedatives*, *narcotics*, and *tonics*, a great confusion of language and ideas having prevailed on these subjects. For instance, any medicine which benefited a person, without evident effect on the bowels, kidneys, &c. was called a tonic; and inasmuch as it restored strength to the system, it undoubtedly had a tonic effect. Now this is the case so often with wine in debilitated habits, that it is no wonder the terms stimulant and tonic became almost synonymous; and the common mode formerly of administering bark in wine increased the error, so that bark was thought stimulant. We have a difficulty, too, in distinguishing the qualities of medicines, from many of them having two or more principles combined, as will be presently pointed out; we may, however, get very nearly pure examples of each—stimulant, sedative, narcotic, and tonic.

A STIMULANT is that which, through the medium of the nervous system, increases the action of the heart and other organs, by calling forth the nervous influence, or by facilitating the extrication of it in them; for example, wine, brandy, and other spirits, the products of alcoholic fermentation.

A *stimulant* increases the action of the heart, and consequently excites for a time the sensorium to hilarity, if there be no latent disease there, by sending more arterial blood to the brain, besides its own effect on the brain when conveyed thither through the circulation; but in too great a quantity it produces stupor. Brandy produces stupor by excess of stimulus, thereby exhausting nervous influence and the perceptive powers of the brain; as looking at the sun will take away the power of the optic nerves by excess of stimulus, and as too great noise will cause temporary deafness: though light and sounds in moderation yield pleasurable sensations.

The effects of stimulants are referrable to a twofold operation, both upon the brain and nerves, and upon the heart and capillaries. Each of these systems, the nervous and the circulatory, is affected by a *local* and a *general* operation of the stimulus upon their respective centres. The stimulant (the alcohol of wine or brandy, for instance), as soon as absorbed and carried into the blood, comes into contact with the internal surface of the heart, upon which organ it acts as an excitant locally,—besides probably its influence on the heart by sympathy, through the branches of the solar plexus of nerves passing between the stomach and heart,—and thus excites the heart to increased activity; from thence the spirit, mixed with the arterial blood, is propelled to the brain, which it excites to a more rapid elimination and distribution of the nervous influence. Respiration, or the decarbonisation of the blood in the lungs, is more perfect; the function of the heart, like that of every other organ, is carried on more energetically as regards frequency and force; the nervous centres receive, therefore, a more copious supply of arterial blood; the sensorium, if the brain be affected by no latent disease, is excited to hilarity; all impressions upon the nerves are perceived by it more acutely; the generation and the flow of ideas are accelerated; volition is more rapid; all the glandular organs, as well as the skin and mucous membrane, secrete more actively; through which, and perhaps by arousing even the comparative torpor of the involuntary muscles, as of the alimentary canal, digestion, absorption, and defecation, are accelerated. These are the effects of moderate quantities of stimuli; in excess, phenomena the very reverse of many of them succeed: the brain is poisoned by the spirit in contact with it; the nervous principle which it contains is expended, and the generation and disengagement of more is interfered with; so that the capillaries, from the exhaustion of nervous influence, become more *distensible;* the imagination is rendered vapid, the perceptions and ideas confused. The brain will be overpowered with arterial blood from the increased action of the heart, which the stimulants have occasioned; for although arterial blood is the source from which the capillaries of the brain prepare or secrete the nervous principle, *over-injection* diminishes secretion (as in the kidneys, &c.); but mere increased action of the heart is not sufficient to produce the bad effects of over-injection, unless the local effect of the spirit upon the brain, as by increasing the distensibility of capillaries, &c. takes place simultaneously. The over-injection will lead to febrile excitement, as it is called, the secretions in every part being diminished from want of nervous energy (besides the over-injection of the glandular organs themselves); and at length, stupor, coma, and even fatal apoplexy, may be the result.

Such are the visible effects of stimulants when administered to persons in health; and similar are those we witness from their agency in disease, although modified by the malady itself under which the patient labours.

Stimulants have been divided into "diffusible" and "local;" we shall see that in this, as in other instances, there are such gradations, that it is difficult to assign the exact limits; they may be all said to be in a degree diffusible, *i. e.* all mix with the blood, and become diffused over the frame; we may take chloroform, ether, and alcohol as the most rapidly and evidently diffused. Phosphorus is diffusible, but more slowly so, and more permanent in its operation; other substances act first upon the stomach, and then upon the other organs, as the heart, by sympathy, that is, from communication of the sympathetic nerve; this is the case with such substances as capsicum, pepper, mustard, and ammonia; for ammonia, though acting thus as a local and sympathetic stimulant, is so rapidly combined and changed chemically, that it does not circulate unaltered like the real diffusible stimulants. The essential oils (including camphor, a concrete essential oil), and the gum resins, balsams, &c., which contain them, are of a mixed nature, acting locally on the primæ viæ, and on the heart through the sympathetic; they are also partially circulated to the heart and brain.

A SEDATIVE is that which diminishes the action of the heart and other organs by repressing the nervous influence; for example, digitalis and green tea, the last of which, though called a stimulant by some, was long since proved by Dr. E. Perceval to have an effect similar to that of digitalis:* green tea,† in excess, produces a sense of anxiety and oppression of the chest, with intermitting weak pulse, nausea, &c. The most diffusible sedative is hydrocyanic acid.

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* The publications of Rush, Rasori, and Tommasini, would, I think, satisfy any person that digitalis is a sedative.

† All teas are sedative, but green is by far the most powerful.

It has been often asserted, that there is no such thing as a direct sedative or allayer of action; but that the sedative effect was only the secondary result of exhaustion from stimulus, persons having argued from the stupid state which comes on in intoxication from fermented liquors. It having been thus observed that a state of exhaustion succeeds intoxication, or any other abuse of stimulus, it became adopted as an axiom by many, that there could be no sedative effect unless secondary, as the result of previous excitement; and I have found many who endeavoured to prove that digitalis at first produces a stimulant effect. The only apparently good argument, in my opinion, that they could bring forward is, that digitalis and other sedatives sometimes make the pulse quicker than it was before; but every person who has bled a few patients must have observed that the pulse becomes quicker as the patient grows faint. Mere increased frequency of the pulse is not therefore a proof, as no person will call blood-letting to syncope a stimulant. It may, however, be contended, that in inflammatory complaints the pulse will become not only more frequent, but harder, that is, in fact, stronger, during the administration of digitalis: but this effect is not produced by the digitalis; for if, when the patient does not take enough, a few drops only being administered at each dose, or bleeding and other remedies being neglected, or the inflammation being uncontrollable by any means (even in the most skilful hands), the inflammation increase, and the pulse become harder; this is not the effect of digitalis, any more than of venesection. Every practitioner of experience must have found the pulse become *harder after a bleeding* which has been insufficient to subdue the inflammation, until *another bleeding* has *softened* it: the same occurs with digitalis. Doubtless digitalis, as well as *venesection*, may *raise* the *pulse* when it has been *depressed* below the natural standard *by inflammation*, as will be hereafter explained; but will any one call venesection stimulant? We should beware of attributing to the remedies the changes of pulse which depend on the progress of the disease.

A direct *sedative* diminishes the action of the heart and nervous system; in a large dose, instead of hilarity, producing anxiety, depression, and despondency; nay, more, allaying action in the nervous system, so that it cannot direct the muscles; the patient becoming giddy and staggering, and even the retina being so weakened as not to see distinctly; so that a person may reel or see double without being intoxicated: the same may occur from loss of blood. It is well to be aware that opposite states may thus produce similar appearances, since the remedy which would cure one would not afford relief to the other: for instance, the coma of children which proceeds from inanition, and which might be mistaken for a plethoric state of the internal vessels, is relieved by stimulants, as is so well described by Gooch, and the nature of which was previously shewn by Dr. Marshal Hall. The disease called DELIRIUM TREMENS has likewise many symptoms in common with those complaints which are cured by venesection and sedatives, but which itself require stimulants, either alone or combined with narcotics.

We see that when nervous influence is expended to the degree that ordinarily induces sleep, or the suspension of sensorial action, this suspension is retarded if any irritation produce a renewal of sensation, as the pain of toothache; or if the extra-excitement of anxiety, in cases where affection or interest is concerned, continue to occasion extrication of nervous influence in the brain: and the power of continuing cerebral action (wakefulness) will be increased by introducing into the stomach a sedative, such as digitalis, or green tea, which, by diminishing the force of the pulse, and by its influence on the brain, counteracts the plethora which would induce sleep. But, observe, the natural powers are by this means forced; the consequence being, that from the expenditure of nervous influence continuing, with diminution of the power of the heart and primæ viæ, the brain will become weaker; so that although thoughts may be excited, they will be vague, and false perceptions will arise.* This state of morbid sensibility of the system is called being nervous, and is experienced by those who have sat up late watching the sick, or reading, and who, having forcibly kept themselves awake, either with or without tea, coffee, or snuff,† become chilly, start at the slightest noise, and suffer involuntary and unreasonable apprehensions of danger. Persons under these circumstances lying down in a cold bed, will frequently not fall asleep, or if they do, will be harrassed by nightmare ;[*] but a warm bed, by diminishing the sensations transmitted from the skin, and at the same time increasing the circulation, will renew a plethora in the brain favourable to sleep; wine or spirits taken into the stomach will do the same, if the brain be not feverish ; or even a draught of hot water will have a beneficial effect by the mere stimulus of caloric.

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* This is the rationale of some kinds of delirium.

† The effect of these luxuries has been misunderstood: for instance, tea and coffee—sedatives—counteract the effect of wine and other fermented liquors. On the other hand, we observe persons render themselves debilitated and nervous by too much tea and coffee without fermented liquors, especially females.

One example more of a direct sedative,—a common dose of salts makes a person pale, and cooler in body and mind. This is not a simple sedative, being likewise an evacuant ; at any rate, it is not a stimulant. I have heard emetics called stimulants ; but to this I cannot consent, until I see a full dose of ipecacuanha or tartar emetic make a person feel well and cheerful, and his pulse stronger, while he is sick. By the relief of disease afforded by emetic medicines, the morbid sensibility, shivering, and depression, in ague, influenza, or inflammation, are removed ; and from this cause, and not by the asserted direct stimulant operation of the emetic, the patient becomes warm, and is relieved from chilliness and anxiety of countenance, precisely as by venesection. (P. 77.) All the purgative and emetic medicines are sedative.

Sedatives, as opposed to stimulants, diminish the injection of the brain, at the same time repressing the nervous influence ; so that the cause of delirium, stupor, or coma, from *sedatives* is *inanition ;* whereas the cause of delirium and coma from *stimulants* is *congestion* or *plethora.*

One cause of the confusion of terms is hereby explained. *Sedatives* are sometimes miscalled stimulants, when they relieve the vertigo, stupor, or coma of stimulants, or the drowsiness of fatigue or other plethora, because this relief is called arousing or awakening ; as by digitalis or tea.[†] On the contrary, a *stimulant* (wine) given to a person fatigued, produces an inclination to sleep, unless it occasion feverishness.

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[*] Nightmare is caused by whatever forces attention on the sensorium during sleep ; thus, it may be produced either by uneasiness in the stomach from indigestion, by cold of the surface, or by cold feet.

[†] It is sometimes difficult to convince persons, who have been in the habit of resorting to tea or coffee for the purpose of enabling them to apply the mind to any mental occupation, that these are sedatives, and diminish the action of the nervous

Tea or coffee appears occasionally to produce an effect the reverse of sedative: thus, in some persons it favours sleep; a result attributable to the circumstance, that sleep is often disturbed in consequence of a plethoric or feverish state of the brain, the effect of stimulant beverages, such as wine, &c.; or of the over-excitement of brain remaining after an evening passed in interesting society, at theatrical exhibitions, or in the arena of debate, when the ordinary status of the capillaries of the brain has been disturbed by exciting passions.

In other cases, coffee and tea favour sleep by counteracting an habitually plethoric condition of the brain, depending on constitutional peculiarity and morbid activity of the heart's function, the tendency of which to cause sleeplessness may be increased by the recumbent posture.

The reader will perceive in the bulk of these observations an illustration of the oft-repeated remark, that opposite causes apparently produce in the animal economy the same effects. We have here pointed out that sleeplessness may arise from either excessive or insufficient injection of the brain; that both fermented liquors (stimulants) and tea, coffee, digitalis (sedatives), may, according to circumstances, prove hypnotic or the reverse.

By the term *sedative* is *not* to be understood that which *puts to sleep*, this being the operation of a *narcotic*, but whatever produces for a time an effect upon the nervous system as if it had been refreshed by sleep, by taking off plethora. But this, of course, has not the restorative effect of sleep; on the contrary, though the ideas are rendered free at first, exhaustion will at length produce the weakness of thought, the delirium or coma of inanition; as the sedative, besides its interference with the restorative influence of sleep,

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system; but they operate only by counteracting the plethoric state of the brain induced by the continued stimulation of action, thus merely restoring the brain to its normal state. The same persons do not require tea on rising in the morning, when the brain is in its natural state, to enable them to study; strong tea or coffee at that time would produce nausea or distraction of thought. On the other hand, some persons whose brain is in a plethoric state, do require coffee or tea the first thing in the morning to enable them to become quite awake.

still further weakens the functions of the sensorium, both by its local effect on the nervous tissue, and by its sedative effect on the heart, diminishing the supply of arterial blood to the brain.

The NARCOTIC principle in drugs diminishes the sensibility of the nervous system, lessens the perception of external objects, and checks volition, thereby allaying pain and promoting sleep. It was shewn above that stimulants, under certain circumstances, promote sleep; but they do not allay pain, in the manner of narcotics. Stimulants do not produce sleep or allay pain till they begin to oppress the sensorium. Narcotics, on the contrary, allay pain and produce sleep without oppression of brain or increase of pulse. Narcotics must be distinguished from stimulants on the one hand, and from sedatives on the other.

Digitalis and brandy, a direct sedative and a direct stimulant neutralising each other, cannot be expected to produce any combined effect; though opium, a narcotic anodyne or hypnotic, may be usefully associated with either, according as a stimulant or sedative is required.

Stimulants promote the extrication and expenditure of nervous influence, as evinced by increased action; sedatives the reverse. Narcotics do not appear to alter the quantity of nervous influence, but merely to impede its communication: morphia, for instance, merely prevents the perception of pain in a part; produces disinclination to muscular action; does not alter primarily the force of the heart, like wine on the one hand, or digitalis on the other, but soon renders it sluggish by retarding innervation, and thus becomes secondarily sedative. Narcotics stop the conducting power of the nerves, which may be thus illustrated:—if the arm be laid across the back of a chair, or be otherwise compressed in one place, the hand becomes what is called asleep, from pressure on the nerves; sensation and voluntary action are lost, or, if not quite lost, much diminished, "pins and needles," a pricking sensation being felt. The state of a limb thus asleep arises from the pressure interrupting the conducting power of the nerves by pushing the medullary matter out of a part of them. If the medullary matter be but slightly separated, the nervous influence is passed like the sparks of electricity, causing the pricking; but if the gap or space be too great, no sensation whatever is transmitted. If the arm be rubbed, so as to press back the medullary matter, the "pins and needles" are felt as it begins to meet. I have known the hand remain powerless for many months before the medullary matter could be rubbed into its place, in a person who, having fallen asleep with his head leaning on his fore-arm over the back of a chair, was affected with temporary paralysis of the hand from this cause. This case was precisely analagous to the state of temporary numbness called being asleep, only of longer duration. The cause was clearly mechanical, and independent of any affection of the brain, as the muscles which bend the elbow, and all indeed above the point of pressure, were in perfect activity: there was no pain or other symptoms of inflammation from which it could be suspected that inflammatory alteration of the nerves had suspended their functions. Narcotics, then, judging by the phenomena described, and others familiar to medical men, appear to interrupt the conducting power of the medullary matter, evinced by their influence over the functions of the brain and spinal cord; and as there is no mechanical pressure, we can account for this only by some chemical action or union with it, altering its (galvanic or electrical) properties.

Different narcotics vary as to their effects. A minute quantity, less than a grain, of extract of aconite, dissolved in the mouth and swallowed, produces a pricking sensation, and diminution of power of the muscles of the fauces, so as to render speech and deglutition difficult. Belladonna produces a similar effect, less a sense of pricking than of dryness.

Tobacco, besides diminishing sensation, produces sickness and other symptoms in the tract of the ganglionic nerves. Stramonium and lobelia are somewhat similar in their action. These narcotics are not used as hypnotics—to promote sleep, because their local effects are so distressing, that they cannot be employed sufficiently to affect the brain through the stomach and circulation; but they are prescribed to allay neuralgia and rheumatism and inordinate visceral actions, as in the lungs, heart, uterus, &c. The narcotics chiefly employed as hypnotics and anodynes are, opium, hyoscyamus, and cannabis. Of these, opium is infinitely the most used and most useful. Hyoscyamus has been employed in preference empirically as an anodyne; but those who perfectly know how to use opiates seldom resort to it. Cannabis, when it can be obtained good, is more efficient than hyoscyamus, but not, in my opinion, equal to the preparations of morphia. This is not the place to discuss its peculiarities, and I may refer the reader to Dr. O'Shaughnessy's treatise. The true guide to the use of hypnotics is, to ascertain what treatment, whether sedative (antiphlogistic), or stimulant, or tonic, or their combinations, should be employed in conjunction with them.

If an opiate be given alone, when the skin is hot and dry, with permanent thirst and other evidences of pyrexia, combined with, or proceeding from, some inflammatory affection, the patient may be forced into a sleep, from which he will awake still feverish, thirsty, and unrefreshed; but this is not the fault of the opiate, but because the necessary sedative antiphlogistic medicines or means (bleeding, &c.) have been neglected; whereas, had sedative, emetic, purgative, or saline medicines been employed, before or simultaneously, relief would have been obtained. This accounts for the extensive empirical employment of Dover's powder (pulv. ipecac. comp.), the sedative ipecacuan and neutral salt in the compound being antiphlogistic; though seldom enough so in the dose usually employed, unless assisted by other medicines. Hyoscyamus having, unlike opium, a tendency to open the bowels, has a sedative influence somewhat similar to the Dover's powder, which accounts for some practitioners preferring it to opiates, but it is infinitely less hypnotic than opium; and as there are cases in which it is requisite to use opiates in combination with stimulants, instead of antiphlogistics, the hyoscyamus tends in such instances to produce delirium instead of sleep. Opium has thus frequently got into disgrace from being employed without proper adjuncts, analogous to the error as to the operation of digitalis (p. 83), not from the effect of the medicine, but the unchecked progress of the disease. Nay, we must go further. Opiates (morphia, &c.) are actually antiphlogistic (though in general not sufficiently so to be depended on alone, as will be instanced farther on); for, by retarding innervation, they render the heart sluggish, as before stated (p. 81), and become thus secondarily, a most powerful assistant in the antiphlogistic treatment. I must observe, however, that though "calomel and opium" are powerful allies to the antiphlogistic treatment, they have often failed, from being employed without being supported by bleeding, or purgative, or emetic, or diaphoretic medicines.

This consideration of the nature of stimulants, sedatives, and narcotics, will enable us to understand what has frequently puzzled practitioners, *i. e.* the uncertainty of the success of opium, or calomel and opium. Thus, there are some persons who are nauseated, or made extremely sick, by opium, as by tobacco; with these the calomel and opium would have an effect as if combined with other antiphlogistics; again, some persons are nauseated, or purged, or both, by the calomel, thus affording an antiphlogistic compound; but there are others whose stomachs bear either calomel or opium without the slightest inconvenience, and with these, of course, calomel and opium would not prove sufficiently quickly antiphlogistic to arrest an inflammation, such as pleurisy or peritonitis, without bleeding or other sedative remedies.

To recur again to the difference between narcotics and stimulants on the one hand, and narcotics and sedatives on the other; sedatives diminish action, but not by interrupting the conducting power; for digitalis or green tea tend to render the perceptions more acute, and produce wakefulness instead of sleepiness; it is not until the nervous influence is actually exhausted, so as not to be sufficient in quantity to produce action, that there is any defect in the perceptions, and then there is delirium, not sleep. Aconite, belladonna, and tobacco, which contain the narcotic and sedative principles combined, are never used as hypnotic narcotics, because in large doses they produce delirium tremens, sickness, and other inconveniences (p. 84); whereas hyoscyamus, which contains a sufficient proportion of the narcotic, with less sedative and no acrid, does not produce delirium tremens, except when misapplied as concerns its *sedative* property; and tincture of opium, which is narcotic and stimulant, never produces delirium tremens, though it may fail to procure sleep, if misapplied as concerns its *stimulant* property. Thus, when administered in cases where feverishness exists, the small proportion of stimulus in the tincture of opium* will often increase the feverish morbid sensibility, enough to counteract the narcotic influence if antifebrile or antiphlogistic remedies be not used at the same time.

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* Opium itself contains in its composition a slightly irritating or stimulating matter, though so little as not to be worth taking into consideration. It was error as to the state of disease, as pointed out above (pp. 73 and 76), which led to the overrating this stimulant property. The irritating part has never been obtained

These three divisions of remedies may be considered physiologically as well as pathologically; that is, their action may be studied both on the healthy and diseased individual. We now come to the fourth division, *tonics*, which can only be considered pathologically, viz. with reference to their agency in removing a morbid state.

TONICS are substances which neither immediately nor sensibly call forth actions, like stimulants, nor repress them, like sedatives, but give power to the nervous system to generate or secrete the nervous influence by which the whole frame is strengthened. The action of tonics (which can be traced to their effect on the nervous system) is gradual; if, therefore, there be any sudden increase in force of the pulse immediately after their administration, it should not be attributed to their tonic nature, as the pulse will vary with the disease, according as it is affected by the use or neglect of other remedies. Thus, either the advance of inflammation, or the neglect of other appropriate remedies, or the administration of stimulants with tonics, will occasion that hardness of pulse which has usually hitherto been supposed to be the effect of a stimulant property in the tonic. On the contrary, a tonic, when it disagrees with the stomach, depresses the pulse, acting as a sedative by nauseating; and even when it causes a quick pulse, which it sometimes does, with headache, this result is mere dyspeptic morbid sensibility. Even tartar emetic, which is recognised as the reverse of a stimulant, when its sedative operation is too great, or has been too long continued, induces the same state of morbid sensibility which has been sometimes denominated "antimonial fever."

We have sufficient proof that the effect of quinine, iron, and arsenic, in neuralgia, &c. is direct on the nerves. There is a palpable analogy between the action of nitrate of silver, sulphate of copper, arsenic, &c. on sores, and their effect on the constitution when

separate, and does not appear to be any of the alkaloids, but is perhaps a resinous matter, which gives the pungent taste to crude opium. Morphia is perfectly free from it, and may be taken as the type of pure narcotic, the long-sought desideratum, an unstimulating narcotic, discovered and sold empirically under the names of black drop and liquor opii sedatives.

introduced through the circulating fluids. In either case, if used in too great quantity, they will do harm; externally, instead of constringing and healing, they prove caustic; internally, also, too much is poisonous: but bark or carbonate of iron which do not produce chemical decomposition, are free from the risk of acting as caustic or poison. Some tonics, then, in excess, as well as stimulants and sedatives, become poisonous. Arsenic produces inflammation, as a poison; but this is not to be referred to when considering the tonic effect of small doses of the mineral; the tonic effect being a modification of vital actions, the caustic or poisonous effect a destruction of the machinery. There is no analogy between the effect of the tonic in proper doses, and the diseased state produced by it when it acts as a caustic poison. Lunar caustic properly applied will heal the skin; improperly, will burn a hole in it. Whoever does not know of what strength to use nitrate of silver or sulphate of copper, had better confine himself to oak-bark or alum, which cannot corrode; or if he does not know how to modify arsenic or croton oil, he had better trust exclusively to Peruvian bark and castor oil, though less efficacious in many difficult cases. Thus, if a man be dexterous, he can perform lithotomy best with T. Blizard's knife; but if not, he had better use a gorget: as an awkward ploughman will go safer with a plough that is gauged by a wheel, than with one that is entirely dependent on the management of skilful hands, but which, when well guided, is the safest and most efficacious, especially in difficult circumstances and rocky ground.

Therapeutics and toxicology require very different modes of investigation; and notwithstanding that experiments which have been made with poisons are very interesting, and useful for the purpose of finding antidotes, they do not advance us much in reasoning upon the remedial use of these substances.

In some cases, by temporarily exciting the nervous system when weak, stimulants give the digestive organs more power for the moment: the new nourishment increases the strength of nerve as well as of other parts; and thus stimlants and generous diet become in reality a part of the tonic plan; and from stimulants being so often administered with tonics, tonics have been thought stimulant. It is of the utmost consequence to know that they are not so, otherwise there may be a fear of using them where they would be very beneficial, combined with evacuants and sedatives; for quinine or other tonics may be advantageously used along with digitalis, diaphoretics, laxatives, and bleeding on the one hand, or with wine on the other. For instance, it is well known that ague attacks the most opposite constitutions, and that some patients stand in need of support, while others, on the contrary, require sedatives, such as venesection, opening medicines, and emetics—still, with the tonics, bark or arsenic, in either case—to cure it.

Medical men were formerly so strongly imbibed with the idea of bark* being stimulant, that they prepared the patient, as they called it, by using the antiphlogistic treatment before they ventured to begin the tonic; but practical experience has long since disproved the necessity of this precaution, and few now spend time in unnecessary preparation by other medicine, or bleed, except when the state of the pulse, and other symptoms, indicate its propriety. Tonics, then, being intrinsically neither stimulant nor sedative, may be usefully combined with either; for whether we want to keep down the pulse in inflammation, or to raise it and the appetite, &c. in debility, it must obviously be desirable to give tone and strength to the nervous system at the same time; because tone and strength of the nervous system will not increase the action of the heart unless it be called forth by stimulants. We must observe this difference: tonics give strength, stimulants call it forth; a man may be very strong without putting forth his strength. We need not fear any danger from keeping the nervous system in good order by tonics, but we must beware of exciting over-action by stimulants, when either inflammation or fever exists. Stimulants excite action, but action is not strength; on the contrary, we shall see, when we come to consider fever, that over-action increases exhaustion.

A correct understanding of these distinctions will be found of great use. The constitution may sink under the depletion necessary to reduce inflammation, or subsequently during a tedious reparatory process, if tone cannot be kept up; but this may be done without stimulation. Often is the practitioner foiled by "pouring in the bark and wine;" seeing the inflammation relighted, he is obliged to leave off the stimulant; but as he includes the tonic under that head, he leaves that off too, and so loses ground: or else, knowing by experience that if he leave off the tonic, the patient will certainly sink, he continues the two together at all hazards, till perhaps the inflammation and stimulus united destroy by fever.

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* Bark (cinchona) does not act always as a simple tonic, for from its taste and effect on the primæ viæ, it sometimes nauseates or purges, and thus becomes sedative, another instance of the necessity of taking always into consideration the possible compound action of every medicine.

It must not be imagined, however, as is too often the case with students, whenever a patient dies, that he might have been saved: they will be convinced by morbid anatomy and experience, that many cases of disease are uncontrollable by human skill and means; but, at the same time, the seeing how much had been effected in ultimately fatal cases, will encourage them in steadily practising on rational principles, and prevent their wavering in cases which are curable, though tedious.

Tonics, such as bark, then, by imparting healthy energy to the capillary arteries, have a beneficial effect on inflammation (the erysipelatous and rheumatic, for instance), even when bleeding and sedatives may be necessary to keep down the action of the heart; but so long as the action of the heart is not below par, the effect of stimulants would be injurious. Sometimes, even when the acute stage of inflammation has subsided or been subdued, the powers of the constitution are so much reduced, that the reparatory process degenerates, so that parts cannot heal; hence the advantage of giving *tonics* to prevent this state as much as possible (even whilst we are keeping down the pulse by bleeding, sedatives, and cathartics), if the constitution seem to require it; but by no means should we administer stimulants in the acute stage. As soon, however, as the acute stage of the inflammation is passed, and the reparatory process or passive stage of resolution commences, we must watch for the moment when it may be necessary to administer stimulants to prevent degeneration of the process, the local symptoms of which are lividity, diminution of temperature, &c.; the general symptoms, feeble pulse and anorexia. If tonics be not given early, as they act but slowly, there may not be time to introduce them into the system when the acute stage has been subdued; and there may not be sufficient strength for stimulants and food to work upon towards restoration.

It is evident that tonics must be considered distinctly from stimulants and sedatives, from the circumstance that we cannot cure an ague or neuralgia, either by stimulants or antiphlogistic treatment, without tonics. We know that many slight cases of either will get well if left to nature; but I allude to those which are severe or obstinate.

The term tonic is applicable to all those medicines which cure chronic inflammation without being either stimulant, or directly sedative or depletory. There are various cases in which bleeding, cathartics, emetics, and other sedative or antiphlogistic remedies, have not power to stop inflammation, and yet, together with the disease, are wearing down the constitution: under these circumstances, recourse has been commonly had to mercury. There are also cases in which arsenic, bark, opium, or other medicines, are preferable; but the great nostrum has been mercury: and yet, though so useful in the most ignorant hands, it has been thought difficult to account for or designate its action. It has often been called a stimulant, and yet it cures inflammation when all stimulants are carefully withheld, and so coincides in its action with the sedatives, and might as justly be called a sedative. But it also cures inflammation in debilitated habits, when wine and other stimulants are necessarily administered. I therefore consider mercury, except as stated p. 84), neither stimulant nor sedative, but tonic; that is, by its specific action on the capillaries, whether directly on their tissue, or through the medium of their nerves, it causes them to contract, when (though all the injecting force of the heart were taken off by sedative treatment) they would not have had power to close; for when introduced into the system, it circulates to the capillaries, and gives them tone to contract, analogous to the effect of an astringent applied to external sores. Liquor arsenicalis, nitrate of silver, the sulphates of copper and iron, mezereon, dulcamara, colchicum, &c. have a similar action; some of which are more available than others in particular cases.

This is also the rationale of the operation of the so-called alteratives, and of what is called stimulating the secretions of internal organs. When their capillaries are weak, they have their tone restored by mercury, and the secretions are thus renewed; but it should not be forgotten that mercury, like some other tonics, in excess becomes poisonous, and may cause inflammation in other parts, as it does in the gums, on the principle adduced before, that one degree of contraction of the capillaries is necessary to reduce inflammation, while a still further degree will stop nutrition, and bring on wasting and disease; as syphilis has been by some starved out at the expense of the constitution. Iodine, arsenic, and sulphate of copper, occasionally produce ptyalism, and are otherwise analogous to mercury in their action. Rheumatic inflammation in the fibrous and other tissues, the capillaries of which are very minute, often cannot be cured by common depletory antiphlogistic means, as above mentioned; but yield to colchicum, mercury, antimony, bark, &c. introduced into the capillaries through the circulation.

The tonic property is frequently combined with astringency; but that they are not identical is evident from quinine, which contains no tannin, and cinchona bark, which contains very little, being highly tonic; while tannin, oak-bark, and catechu, are very slightly so. Still, however, we are at a loss to conceive any other than an astringent effect produced primarily by the tonic substances. All the metalic salts have, more or less, an astringent effect on the capillaries; and to this influence I attribute the universal efficacy of antimony as an antiphlogistic remedy, it being doubly valuable in acute cases, from its sedative effects on the heart and pulse, combined with its locally tonic or astringent effects on the capillaries of inflamed or congested parts, as well as on those of all the secreting structures. Hence, too, its efficacy, in small repeated doses, in cases where there is great depression of the system, by its relieving the relaxation of the capillaries by which the depression is caused. Nay, more, we can manage to insure its full antiphlogistic effects without the inconvenience of nausea, by combining it with a little opiate and aromatic.

From the analogy of the efficacy of tonic medicine in curing chronic inflammations and neuralgic diseases, we may, I think, infer, that the latter depend on a chronic inflammatory state of the nervous tissue.

As I set out with observing, it may be seen that tonics must always be considered in reference to disease: thus, different substances which, considered physiologically, or in health, belong to opposite classes, become, in disease, tonics. Even narcotics frequently become, in an indirect manner, most usefully tonic; as, for instance, when rest is prevented by the morbid sensibility of a sore which will not heal, banishing "kind nature's sweet restorer, balmy sleep;" stimulants in this case cannot procure repose nor give strength; sedatives are not required, or rather are contra-indicated; sometimes even one dose of a narcotic, by procuring a good night's rest, will renew the restorative energy of the system; although a single dose will not, in general, suffice. The value of repeated small doses of opium in chronic periosteal diseases, and what are called irritable sores, as exemplified in Pott's treatment of gangræna senilis, is well known to surgeons; and also to physicians in chronic affections of the mucous membranes, &c. Its applicability to irritable sores shews that the efficacy lies in the narcotic quality, though it is commonly attributed to a stimulant one even by those surgeons who know how much more they can effect, in such cases, by administering from a quarter of a grain to a grain of opium twice or three times in the twenty-four hours, than by giving wine, spirits, or beer, which are incomparably more stimulant. On the other hand, when the constitutional state is that of debility, rather than irritability (morbid sensibility), as in strumous and certain other cases, fermented liquors are of much more value than opium. There is nothing more efficacious than opium in catarrh; but from the idea of its being stimulating, or heating, which it appeared to be chiefly where it confined the bowels, we find that all the experienced practitioners formerly combined it with small quantities of jalap, ipecacuanha, &c. in catarrhal affections.

I take this opportunity of pointing out the common error with respect to opium. It will be much better to get a clear notion of the nature of remedies, and to call them by their right names; as, for instance, not to denominate opium either stimulant, sedative, or tonic, but to understand its use by its true name of narcotic. Its beneficial effect arises from its *narcotic property* diminishing that *morbid sensibility* which prevents sleep, digestion, and other restorative processes: and this is the PRINCIPLE to be followed in the administration of narcotics. The choice of them has already been explained, as to opium, hyoscyamus, morphia, tincture of opium, Dover's powder, &c. The addition of opium, when mercury is employed, is a judicious precaution, as mercury has a tendency, though primarily a tonic, to produce morbid sensibility secondarily. These few words will serve as a clue to the use and abuse of mercury. Mr. Skey, in a useful little practical work on the treatment of ulcers, has brought forward evidence which supports my opinion of the explanation of the utility of opium; though he seems to think the benefit is owing to a "stimulant effect of the opium upon the capillaries." Opium is invaluable to the accoucheur, to allay the morbid sensibility which occurs after parturition. Some use it in the puerperal state as a "cordial," some as a "sedative," some to "bring on" action, some to "allay" it; as, for instance, to assist labour when it flags; or, on the contrary, to check inordinate uterine contractions. If the midwifery practitioner will recollect that the object is to *allay morbid sensibility*, he will be certain in its application; whether he be obliged to use the narcotic with stimulants on the one hand, or with depletion and sedatives on the other.

This distinction of *stimulants*, *sedatives*, *narcotics*, and *tonics*, assists in understanding the operation of remedies in various diseases, it being recollected that the medicines which are used as purgatives, emetics, diaphoretics, and diuretics, such as salts, senna, jalap, tartar emetic, calomel, ipecacuanha, squill colchicum, &c. are sedative in their operation. The effect of tartar emetic is sometimes intended to be merely local, for the purpose of emptying the stomach, and then it is given in a full dose; but it will perhaps surprise some to learn that tartar emetic, as a general sedative remedy will allay sickness. For example, inflammation of the mucous membrane of the intestines is accompanied by nausea and sickness;* these symptoms may be checked sometimes, even without bleeding, by frequently repeated small doses of tartar emetic, called by some febrifuge.

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* A patient was admitted into the London Hospital, who had been labouring under diarrhœa and vomiting for two days, for which he had taken chalk-mixture, catechu, opiates, &c. unavailingly. The skin was hot and dry, with wiry pulse, dry tongue. &c. I prescribed one sixteenth of a grain of antim. tart. every two hours He did not vomit after the second dose, and rapidly recovered. I pointed out (p. 93) that antimony acts as an astringent on the capillaries, and in this way it acts on the congested mucous membrane in such cases as the one related; also in tedious cases of diarrhœa after scarlatina or measles, which I have stopped in this way (after opiates and vegetable astringents had been tried in vain); sometimes with calomel, according to the state of the liver, sometimes without; and similar treatment I have proved to be successful in cholera, whether Asiatic or induced by drains, cesspools, &c.

We see that the action of medicinal agents become most opposite when the proportional quantities are varied, and according to the state of the disease which may exist; hence it requires great attention to separate the causes of phenomena, and duly estimate them. The whole practice of the healing art is full of apparent contradictions: for instance, opium makes the pulse stronger or weaker, promotes and takes away appetite; the same means appear in one instance stimulant, in another sedative; venesection sometimes makes the pulse smaller, sometimes fuller. When we speak of remedies as stimulant, sedative, narcotic, and tonic, we are to consider their moderate action whilst they are working on the natural powers of the organs, and not their exaggerated or poisonous effects when they begin to excite either inflammation or morbid sensibility; or, again, when they suspend the vital functions,* as sedatives do in excess, in which case they have frequently been misnamed narcotics, as has been done with colchicum,† digitalis, hydrocyanic acid, &c.; which, though in excess they may produce vertigo or insensibility, do not terminate in sleep, but in fainting or death. Brandy or wine, in moderation, acts as a stimulant upon the nerves of the stomach and other parts in a healthy state; in too great quantity, there is a noxious effect on the organ, its natural susceptibilities being perverted, and a sedative effect communicated to the nerves of the heart,

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* This may be evinced by the confused statements of Orfila, and other toxicologists. The symptoms immediately preceding death being so similar in many cases, though produced by different agents, that, in fact, from the final phenomena produced sometimes by oxalic acid or arsenic, these might be called narcotic. Stimulants and sedatives have been confounded with narcotics, and *vice versa*.

† When colchicum was introduced some years ago, as a substitute for the *eau medicinale*, to cure gout and rheumatism, I heard many persons assert that it was a narcotic, on account of its rapid effect in removing the pain. Venesection, when it relieves the pain of pleurisy, or an emetic when it takes off a sick headache, might as well be denominated narcotic. Anæsthetic, a modern term much used, must not lead us to confound stimulants with narcotics, or sedatives, or venesection, all of which we know are in turn anæsthetic—for instance brandy, bleeding, opium, colchicum, cannabis, hydrocyanic acid, chloroform, &c. I can recollect brandy being given sometimes to patients to help them to bear the pain of operations as chloroform is now, and it is well known that brandy dulls sensation of pain or fear though not a narcotic.

&c., so that a person intoxicated will become sick, with cold sweat and a weak pulse, though wine and brandy are stimulants. Again, the state of disease causes deception as to the nature of an agent: for in inflammation, which makes the pulse weak from its severity, brandy, by increasing the inflammation, would weaken it still more; whilst sometimes, on the other hand, sedatives, as digitalis, antimony, and bleeding, as has been already explained, raise the pulse by relieving the inflammation.

Tonics, even mild ones, as bark and iron, will excite nausea, when there is much of that morbid sensibility of stomach, which they will eventually cure, if more gradually introduced; others, in excess, as arsenic, will occasion morbid sensibility and inflammation of the gastric and intestinal mucous membrane, which might appear to confirm the opinions of Broussais. Nevertheless, the full tonic or sedative effects of medicines may be produced without risk, and with benefit, if administered in proper quantities, and not misused, though this pathologist anathematise arsenic, salts, senna, tartar emetics, &c. Praised be Rasori and his followers, Tommasini and the rest, who have given us myriads of proofs of this, if our British practice did not afford a sufficiency. Sulphuric, nitric, and oxalic acids, in their concentrated state, like arsenic, produce fatal inflammation; yet when sufficiently diluted with water, not only afford an agreeable and refreshing beverage, but are efficient in allaying inflammation.

I may add a few hints here on the selection of tonics. Iron or steel (chalybeates) has been used from time immemorial as a strengthening medicine, and is powerfully so, and thus restores the colour of anæmial or chlorotic patients; and it was supposed from its chemical action on the red particles quoad iron, but this is not the case, for you restore the red colour of the sallow anæmial ague patient by cinchona without iron; of the chlorotic patient by myrrh, turpentine, or cubebs, without iron; of the liver-diseased patient by mercury, &c. without iron. Thus it is very true that iron does restore the red colour of the blood and complexion, but not more than other tonics which restore the health. Some chlorotic cases are cured by iron which have resisted other means, but sometimes it is *vice versa*, and iron could not restore the colour of either the ague or liver cases. Iron sometimes disagrees by forming astringent compounds in the primæ viæ, which irritate them, and produce sympathetic headache, and confine the bowels. This may be corrected by combining appropriate laxative, alkaline, or other medicines, or if not, in a variety of cases, such as chorea, epilepsy. &c. zinc or bismuth may be advantageously substituted for it. The latter especially, being a powerful tonic, with a tendency rather to relax than confine the bowels, and it is a most efficient tonic in dyspepsia. Bark and quinine, on the contrary, frequently irritate the stomach, and produce sympathetic nervous headache, through the par vagum or sympathetic nerves, without, however, any danger of plethora, or what is called determination of blood to the head; for when large doses of quinine produce headache, or even temporary deafness, in the way just stated, that effect, however inconvenient or disagreeable, is not dangerous, and does not require the leaving off of the medicine, if fairly indicated, for ague, neuralgia, &c., and it may be corrected by appropriate medicines, combined with the quinine. Mercury and iodine I have spoken of elsewhere. Arsenic is a most efficient tonic, very safe and manageable if used with caution; in general, from three to five drops of the liq. arsen. is quite enough. Many persons are so susceptible to its action, that one drop three times a day is more than they can bear; but many persons are equally sensitive to mercury, to ipecacuan, or other drugs. The peculiar advantage of arsenic is, that besides its powerful tonic effect, it acts on the liver as much as mercury; and, in fact, acts in neuralgia and ague, like a compound of bark and mercury, without the inconvenience of producing salivation; and its influence in skin diseases is unequalled by any other medicine. The oxyde of silver is a useful astringent tonic in uterine affections, and some cases of passive hæmorrhages, and other disorders of mucous membranes. The profession is indebted to Sir James Eyre for a useful little treatise on the subject.

I have passed over a number of bitters which are called tonics, and also mineral acids, &c., but these are rather employed as local tonics to promote appetite in the stomach, than as what we have been here considering, general tonics of the nervous system. They are doubtless tonics, although so far unequal to quinine, iron, &c., as not to be depended upon when prompt and decided tonic effect is required, as in ague and neuralgia.

The varieties of inflammation may be understood by always recollecting that the heart is acting against the arteries, and that both heart and arteries derive their power from the nerves; and it is the discrimination of cases where stimulants are admissible with tonics, or where tonics should be accompanied by evacuants, that constitutes skill in conducting the constitutional treatment of many diseases. Thus, inflammation may go on when the pulse is very weak, and when the heart is acting much more feebly than natural; but the arteries being even weaker in proportion, give way, as we see in broken-down constitutions, where inflammation is cured by tonics with stimulants, which raise the pulse, but which, at the time, by improving the appetite and digestion, the formation of good chyle and blood, nourish and increase the energy of the nervous system, so as to communicate to the capillaries a tone or power to resume their healthy action, more than equivalent to the increased action of the heart. In some cases, by good food, and tonics such as bark without stimulants, we communicate an energy to the nervous system, which restores the healthy action of the capillary arteries. Thus tonics are useful in many instances, by communicating power to the capillary arteries through the nerves, where stimulants would be injurious, from their increasing the heart's action. Again, tonics are beneficial, even in conjunction with abstraction of blood and evacuant remedies, in keeping up the energy of the nervous system, so as to restore the proper action of the capillaries.

To beginners, the treatment of inflammation in different ways must appear contradictory; even to practitioners of experience, it is sometimes difficult; but it will be found rational and consistent by those who have a clear conception of the *modus operandi* of medicines, and by a reference to the various states, both of the parts and of the constitution, which exist under the name of inflammation.

Let us now examine some of the more common phenomena of inflammatory affections, and the remedies applicable, in order to see how far we are borne out in the preceding statements, beginning with the simplest forms, unconnected with what is called constitutional disturbance, and proceeding to the more aggravated and serious forms of disease. As an instance, let us take the eye, or some part of the skin, subjected to a blow, or a stream of cold air; or heat applied to the skin, so as to give pain and excite redness, without blistering ; or the effect of a mustard poultice, or of a cantharides plaister taken off before it has had time to raise a blister, having only produced redness: here, upon visible parts, the first and slightest degree of inflammation arises, that is, a blush of redness, with a degree of tumefaction of the vessels, and pain, or a sensation of heat or itching in the parts. Or let us suppose a mucous membrane slightly injured, as that of the nose or windpipe, by sudden alternation of temperature, &c., producing either painful dryness, or an increased flow of mucous, with uneasiness or itching, which is the slightest degree of inflammation in those parts, commonly called catarrh; or the mucous membrane of the intestines injured by bad food, as sour fruit or sour wine, which produce a flow of mucous or watery fluid, with uneasiness or griping, called diarrhœa.

I must here explain the apparently contradictory assertion, that the distended state of the capillaries at one time produces an increased flow of mucous, and at another causes dryness. In their healthy state, the mucous membranes are scarcely moistened by their vessels, any more than the serous—they are merely kept lubricated and soft; but the effect produced by the first degree of inflammation of the mucous surfaces is, by the relaxation of the exhalent capillaries, a more rapid extrication of the fluid part of the blood, a thinner saline serous (coryzal) fluid, instead of bland mucus; but as inflammation subsides, the vessels, recontracting, secrete a mild scanty mucus again: these are the well-known phenomena of that slight degree of inflammation, catarrh, which occurs in cold weather, and lasts often only a few hours. The effect produced by a higher degree of inflammation of the mucous surface is dryness—a stoppage of secretion (as explained p. 46 et seq.), which state Laennec denominates "*dry* stage of catarrh" (dry flux!), but for which the old term bronchitis is the correct one. It seemed as if he could not reconcile the use of the word *bronchitis* with the stimulant treatment useful in many cases of catarrh, and which he extends even to some cases of bronchitis; for though he has mentioned the use of stimulants empirically, he has by no means explained their operation, nor given any satisfactory rules of guidance in the selection of stimulants or sedatives in the "dry stage of catarrh," which has even led some to doubt whether catarrh be inflammation. It should be understood that the dry stage is bronchitis; and while it lasts, stimulants should be withheld, inasmuch as, at a stage higher than that, mischief and disorganisation would commence; but when there is merely catarrh, congestion and relaxation of the capillaries, the stimulants, by increasing nervous energy, on the principle laid down, do more good to the capillaries than any increase of the heart's action could harm them. Thus stimulants with opium usually cure catarrh, and frequently augment bronchitis.

We cannot have a better opportunity than this of explaining a few rules for diet; and it will be seen that some old popular sayings, resulting from experience, are based on truth—*e. g.* "feed a cold, and starve a fever." It will be found, generally speaking, that it is not necessary to *starve* a fever; one of the first evidences of fever, however slight, being want of appetite (anorexia). Natural instincts are too often thwarted; it is much too common to put patients empirically on low diet; and patients of the higher classes, the better educated, very often put themselves on low diet unnecessarily. How frequently have I been consulted by persons for aggravated catarrh, which they said was "getting worse and worse, though they had been living low, taking slops, and no wine," and perhaps opening medicine! The nerves and capillaries, which would have recovered their tone under the ordinary diet, were thus kept debilitated by the unnecessary sedative treatment.

The cases just described are curable in a few hours by animal food, a glass of wine, or other fermented liquor, and a dose or two of any opiate, unless, perhaps, the outraged stomach have lost its appetite, in which case a few days tonic treatment will be required to undo the mischief. Thus, so far as we may take natural instinct for a guide, we may assert that when a patient *can* eat, he may be allowed to do so;* for if he have even a slight degree of fever he *cannot* eat. This will also direct us in the use of wine, &c.; the loss of appetite, shewing feverishness, requires the withholding of stimulants, except that sometimes, in chronic cases and convalescence, delicate persons require a little stimulus to the stomach to induce them to begin to take food. Again; so long as the appetite continues good, fermented liquors may be used; but as no rule is without exceptions, so there are of course many both medical and surgical cases of inflammation, in which, though the appetite have not failed, it is necessary to forbid stimulants.

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* This, of course, does not apply to many surgical cases, accidents, where local inflammation is to be treated by antiphlogistic means.

These instances of simple local disease hitherto adduced depend upon one morbid change, viz. an enlarged state of the minute capillaries of the part, from their tone being diminished, either from the vessels themselves being injured as by a blow, or by their nerves suffering injury from excess of cold or heat, or acrid matter applied to them.

In the examples given, the parts generally recover of themselves gradually, the vessels contracting to their natural size; or if they do not, mere local means will be sufficient to restore them to a healthy state, such as the application of cold and astringent lotions, with abstraction of blood by leeches, to unload the vessels; warm stimulating liquids or astringents internally, warm fomentations externally, acting through the medium of the nerves; and thus either the inflammation is cured, or it subsides without remedies, by what is called resolution.

In considering these examples of simple local inflammation, I have made no mention of constitutional symptoms. Insimple local inflammation, the nervous system, the brain, spinal cord, and ganglionic nerves, are not sympathetically affected; the heart's action, as measured by the pulse, is unaltered; the digestive system is unimpaired; the appetite, and the functions of the intestines and kidneys go on as before.

As a second state of disease, let us investigate a greater degree of local injury, where the minute arteries have suffered so much that they cannot recover of themselves, nor by the aid of mere local applications. Here the first symptoms of constitutional disturbance arise, viz. restlessness, or a general sense of uneasiness, and increased action of the heart; shewing that the nervous system is partaking of the morbid sensibility of the nerves of the inflamed part, and that the irritability of the heart is increased, rendering it more excitable by its ordinary stimulus, the nervous centre from whence its nerves are derived being more susceptible. A very common effect of the derangement of the nervous system in this stage is a diminution of sleep, which is sometimes attributed to pain, but which really depends more on the degree to which the nervous system is affected; for persons will sleep at one time with much more severe pain than that which will at another banish rest. In the present instance, however, in addition to the local disease, which exists as in the first case, the most marked symptom is increased force in the pulse; and as this increase of force in the injecting action of the heart tends to keep up and aggravate the disease, it is necessary to diminish its action and guard against renewal. To diminish this *vis à tergo*, we may either take blood by venesection, or, by putting on a greater number of leeches than in the former case, we may lower the pulse at the same time that we relieve local fulness: having thus lowered the pulse, we are to avoid every thing that might raise it again; and as exercise and generous diet do this, rest and low diet are essential parts of the anti-inflammatory, or antiphlogistic treatment. In addition to rest and low diet, we possess other means of lowering the pulse besides abstraction of blood; that is to say, by sedatives, and by drugs of the emetic and purgative kind, both of which, by diminishing the action of the nervous system, in addition to their ordinary evacuant effect, have a tendency to produce temporary faintness and weak pulse. This sedative effect constitutes their utility in inflammatory disease, usually more than the mere emptying of the stomach and bowels: but we administer antimonials, mercurials, neutral salts, &c. in frequent small doses, which do not cause vomiting or purging, under circumstances where it is not necessary either to take away blood, or to exhibit cathartics or emetics, in full evacuant (sedative) doses.* Digitalis has a power of controlling the action of the heart; but though it has its advantages, its influence is not so certain and manageable as to make it a substitute for blood-letting, the relief from which is usually instantaneous; whereas some hours at least are necessary for digitalis to produce its effect; and when it begins to lower the pulse, if rapidly introduced into the system, it must then be closely watched, lest it produce too great depression;* so that in acute diseases, digitalis may assist, but cannot generally supersede blood-letting; while, on the other hand, it is of the greatest use when blood cannot be spared. Digitalis cannot be employed as a substitute for bleeding in cases where we resort to this operation not on account of inflammation, but merely to relieve the mechanical congestion which may be the cause of urgent symptoms of the heart, brains, lungs, liver, &c.

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* In this paragraph we are discussing exclusively the *vis à tergo*, but in practice we must never neglect the consideration of the effects of these medicines on the capillaries when conveyed to them through the circulation. (See p. 70.)

The statements hitherto made will account for the great benefit of opium during or after inflammation; when often morbid sensibility remains, which would wear out and destroy the patient, though the inflammation be past, or stopped by bleeding, or other remedies. Opium, which has been usually considered inadmissible during inflammation, until depletion has been employed, is of advantage in supporting the system under injury, during the restorative process. The use of opium has been pointed out by the best authorities, in peritonitis, peripneumonia, &c. or whilst the inflammation is decreasing, and during the reparation of the injured parts. In the cases alluded to, it is given immediately after free bleeding: the bleeding checks the inflammation, and the opium removes the morbid sensibility. On any relapse of the inflammation, evinced by the skin becoming hot and dry, the opium must be combined with renewed antiphlogistic remedies. The case must be closely watched for febrile symptoms, lest the anodyne, by allaying pain, should deceive the practitioner (of which there is great danger in inexperienced hands) and the inflammation re-light, as it will, unless antiphlogistic medicines, such as antimony, digitalis, neutral salts, &c. be administered to keep it in check, in graduated, but by no means full doses, though that was necessary at first.

Opium has commonly been used empirically with antiphlogistic remedies to relieve pain; but it is, in many instances, itself antiphlogistic; for by allaying morbid sensibility, it quiets the inordinate action of the heart (p. 101), characteristic of inflammation, and thus keeps the pulse from becoming hard. Nay, more; morphia, in particular cases, proves powerfully antiphlogistic—even sedative, secondarily; repressing the action of the heart by diminishing innervation. In fact, morphia freely used in combination with mercury, antimony, colchicum, &c., at the onset of inflammation, as in visceral inflammation or acute rheumatism, may supersede the lancet, particularly in feeble constitutions, in which, after loss of blood, a tedious convalescence might be expected. The debility produced by morphia, mercury, antimony, &c., when not the result of any evacuant effect of these remedies, is indirect and easily recovered from. Patients sometimes become so weak under the influence of repeated doses of morphia, especially when it diminishes the appetite, as to require wine.

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* Where this is likely to occur, as in debilitated constitutions, morphia will be much preferable, as shewn further on.

We may, I think, account for the diversity of reports made as to the ill effects of "opium-eating" on the constitution, by considering the various circumstances as to diet, exercise, &c., under which this vice is indulged in. The indolent Asiatics, who take their dose and sit still, indulging their reveries, neglect taking food, or the appetite and digestion become impaired, so that the frame is destroyed, as has been usually described; but in this country this is not always the case, except with the rich, and, above all, the indolent. Many of the lower classes, with whom the practice may be considered almost as a virtuous substitute for the common vice of gin-drinking, are not permitted by the necessity of daily labour to neglect exercise; and thus retaining their appetite for food, suffer little or nothing from the opium. In the higher classes, who live well, unless indolence combine, the opium does not prove always destructive of the constitution.

Notwithstanding what was formerly said of *sedatives diminishing* the *drowsiness* of plethora, it is nevertheless true that *digitalis* will *procure sleep* where excitement and wakefulness have been kept up by inflammation of the brain, congestion of the lungs, &c., with a full, hard pulse, such as we often feel with hypertrophy of the heart, and which hardness must be combated by digitalis, after bleeding, &c. (see page 80). This disease of the heart being organic (structural), no amount of bleeding could remove; but the symptom may be relieved by digitalis, hydrocyanic acid, &c., without profuse expenditure of blood; under most of these circumstances, however, morphia will be found a good ally, where it does not even supersede digitalis.

It is needless, however, for me to multiply examples: the student must apply the rules at the bed-side; and the memory of any man of experience who reads this will supply him with illustrations: but this organic cause of hard pulse is worth mentioning, as it is a source of embarrassment to young practitioners.

This affords another instance of remedies belonging to a certain class acting, under peculiar circumstances, after the manner of those of a different class; for although venesection or digitalis may procure sleep by their sedative influence in lowering the force of the circulation, as described, neither of them are narcotics. Yet digitalis or venesection do not always act by lowering the activity of the circulation, or injecting power; on the contrary, we have before alluded to their raising the pulse (p. 96), in opposition to their properties as sedatives. This fact shews the necessity of referring to the proximate cause of inflammation—the state of the capillaries; for in many cases, the cure of the inflammation is effected by the operation of the remedies on the capillaries as well as on the heart; the venesection relieving the capillaries mechanically by diminishing the quantity of blood,—the medicines by their constringent property increasing also the contractile action of the vessels.

Hydrocyanic acid is a valuable sedative in such cases as whooping cough, phrenitis, &c. It may be used as a sedative when digitalis disagrees with the stomach or head; thus we may sometimes relieve the excessive action in hypertrophy of the heart by hydrocyanic acid, and at the same time improve the digestion by it, after having been obliged to forego the digitalis, on account of its producing nausea and cardialgia, although it had reduced the pulsation. Hydrocyanic acid is a useful remedy for that dyspepsia which is caused by hyperæmia of the primæ viæ; and it may here be observed, that if more attention were paid to discover the proximate cause of the individual cases of dyspepsia, the disease would not be found so difficult to cure. The depressing effect of digitalis on the spirits and appetite is frequently a serious objection to its use, notwithstanding its great value as a sedative remedy. And where there is morbid sensibility with debility, as in many hysterical cases, producing palpitation, digitalis would be too lowering, and so not adapted to diminish the frequency of the pulse. Besides hydrocyanic acid, morphia, as before mentioned, a narcotic which is secondarily sedative, may sometimes be substituted for digitalis; nevertheless, there are many cases in which the experienced practitioner will use digitalis with much more effect than either of those remedies.

In the first and second cases, or degrees of inflammation hitherto considered, we have had the same structures under consideration, as the subjects of local disease produced by injury of some kind, viz. the eye, the skin, the mucous membranes of the chest or abdomen; as subjects of slight ophthalmia, erysipelas, bronchitis, catarrh, and diarrhœa; but curable before having gone the length of producing what is called constitutional disturbance, except raising the pulse; and but few remedial agents have been mentioned, nothing having been said of blisters and other counter-irritants, or the warm bath, &c., but merely what is judged sufficient for a brief illustration of the subject.

The raising of the pulse we have traced to morbid sensibility propagated from an inflamed part. Before proceeding further, it is necessary to consider more particularly this morbid state of the nerves, whether partial or general, to which the word "irritation" has been usually applied, but for which I have adopted the term MORBID SENSIBILITY. Morbid sensibility is that state of the nerves or central organs which renders them more susceptible to impressions than natural. And in order to explain the occurrence of morbid sensibility in its various forms in different organs, we must assume that the nerves of proper sensation, the organic, and the incident filaments, as anatomically demonstrated by Grainger, in support of the truth of the reflex theory, may all evince or be affected with morbid sensibility in the periphery, or at their origins.

It was mentioned (p. 37.) that *sensibility* is a characteristic property of nerve, and that there is no such thing as the "organic sensibility" of Bichat, independent of the nerves. If, therefore, certain diseased states, unaccompanied by pain, termed "irritation," exist in a part, of which the spinal cord takes cognizance, and which are indicated by subsequent production of abnormal muscular contractions in distant parts of the body, it follows that the spinal cord has *become sensible* of that diseased state, that is, has participated in the morbid sensibility, although the *brain* has not been informed of it; and therefore, as I know no other term than morbid *sensibility* (*susceptibility*) to impression, (*impressibility*), equally intelligible and applicable to designate the morbid *state* of the brain, of the spinal cord, or of the sensitive, organic, or incident nerves, which has been miscalled "irritation," I do not hesitate to employ it.

If the nerves of *sensation* be rendered morbidly sensitive, pain is produced by common occurrences which ought not to affect them, such as pressure either from external things, or even of the surrounding parts (p. 54). This morbid sensibility of nerves of *sensation* is not always confined to the nerves of the inflamed part, but often spreads to the branches of nerves which communicate with them *directly* or through the nervous centres, thereby producing *sympathetic* morbid sensibility, and pain or tenderness on pressure, &c. It appears to be opposed to our knowledge of the anatomy of the arrangement of the nervous fibrils (of which there is no anastomosis, as in the arteries, &c., but merely a juxtaposition of cylindrical or varicose tubes, as the pipes of an organ), as well as contrary to the laws which regulate the transmission of impressions (which is generally considered to be only *centripetal* in the sensitive nerves, *i. e. from* the periphery of the body and various internal surfaces and parts *to* the brain), to assert that sympathetic pains are produced by any influence spreading or being communicated directly from one branch of a nerve of sensation to other branches of the same nerve, or to different nerves in the same neighborhood. Nevertheless, our experience in the observation of disease appears to indicate that the communication does actually take place; for instance, sometimes disease of one tooth, irritating or disturbing the state of one filament of the superior maxillary nerve, induces pain, not merely in some other, or all the dental nerves, and the cutaneous twigs of the cheek of the same side, but also in the corresponding frontal branch of the fifth,—as, from tooth-ache, tenderness on pressure is felt in the temple; and, what is still more extraordinary, pain in the dental branches of the opposite side of the jaw, or even of the inferior maxilla.

These morbid sympathies take place *without inflammation* being communicated to the sympathising part, although sometimes the inflammation does spread: as the cheek will swell and inflame during tooth-ache; the inguinal glands from the urethra being inflamed, &c.

True indisputably as the axiom in physiology is, that each filament of a sensitive nerve preserves its individuality throughout, and that its peripheral extremity corresponds to a particular part of the cerebrum, which it painfully or pleasurably affects whenever it is impressed,—as any given wire of a piano, or the air in the pipe of an organ, is set into vibration when the particular key it responds to is touched,—it still appears incontrovertible, that the mass of filaments in a nerve, or nerves, which arise in the central organ near to one another, or even in those not neighbors at their origin, are influenced, to a certain extent by one another. I am of opinion that the diseased state of the nerve is communicated to that part of the brain where it arises; and this morbid state, spreading to the root of another nerve, whether near or distant, causes pain to the individual, which, though felt in the brain, is referred of course by him to the part in which the last-mentioned nerve ramifies (as pain is referred to a paralytic hand, which is caused by lesion in the brain at the root of the nerves of the hand.) This is illustrated by what we have said of the concomitant affections of the different nerves of the trigeminus. In like manner, certain impressions conveyed by nerves from distant parts to the spinal cord affect certain motor filaments therein, and thus produce involuntary muscular contractions.

Sometimes the part in which the *morbid sensibility* originates may not even be in pain, and the irradiations or transfers of morbid sensibility take place in such cases from parts supplied chiefly by the sympathetic nerve, to parts in which ramify the cerebro-spinal nerves, as in uterine affections we have tenderness on pressure over the abdomen, pain of the left side, palpitations, globus hystericus, or convulsions, &c.; or in diseases of the liver, nausea, or pain about the right shoulder, or from worms in the intestines which are not felt, convulsions. Here the morbid sensibility can only have been communicated *via* the sympathetic or spinal marrow and the brain.

Morbid sensibility, as already mentioned, often exists, producing *sympathetic* pain in another part, though none is felt in the seat of inflammation, if that be not pressed or moved, as in hysteria, and other morbid states of the uterus. Whilst the person is at rest, no pain is felt in the uterus, it being so situated as not to be annoyed, though its tender state is evinced by the slightest touch, or even by the pressure on the perineum in sitting down. In many cases, certain nerves which communicate, whether through the central organs or otherwise, with those of the uterus, being implicated, the parts in which they ramify are rendered tender on pressure, or painful on motion. Thus the sensitive uterus being quiet and protected, its nerves are not disturbed, and no pain is felt in it, though, owing to the sympathetically affected nerves of the intestines being morbidly sensible to their contents and to the peristaltic motions, there are constant colicky pains. For the same reason, there are pains in the loins from the least movement, or in the hip, simulating sciatica, or producing apprehensions of hip-joint disease; the parietes of the abdomen do not bear motion or the slightest pressure, so that peritonitis is simulated. The morbid sensibility in the respiratory apparatus produces cough, and through the mechanical irritation of the latter, even spitting of blood, and thus occasions apprehension of consumption; and the motion of the heart causes pain in the left side, the most frequent and tormenting of the painful sympathies of hysteria. The stomach also is morbidly sensitive in these cases,* as well as during utero-gestation, so as sometimes to be affected with pain after eating, sometimes nausea or sickness. In like manner, in some stages of inflammation of the liver, that organ lying quiet and protected, no pain is felt in it unless it be pressed upon; but the patient is annoyed through the morbid sensibility communicated to other parts, as, for instance, to the stomach, which being a complex mobile organ, evinces the morbid sensibility communicated to it by the uneasiness called nausea; or there is sympathetic dry cough, as in hysteria; or pain of the shoulder, head, &c. Inflammation of the kidney produces sympathetic sickness, &c. in the same way; and inexperienced persons do not suspect, or cannot find out, which is the affected organ, when nausea or cardialgia is the most troublesome symptom (page 25, note). This will shew how most diseases disturb the stomach, and consequently the digestion; but in how few cases of indigestion is the stomach itself first diseased, though dyspepsia is a most convenient word, and the poor stomach is blamed for faults not its own. Nor is it clear that the digestive powers were primarily out of order because blue pill cured the disease which had produced sympathetic morbid sensibility of the stomach, nor that the action of the blue pill was particularly on it; for blue pill introduced into that receptacle will, of course, find its way into the circulation, and thus to whatever organ is diseased,—which will account for the innumerable cases to which it is applicable.

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* The term hysteria is not applied merely to those aggravated cases which are accompanied with fits, &c., which cannot be mistaken; but to those slighter cases also, in which the derangement in the uterus is latent, although it induces urgent symptoms elsewhere; and in some cases the uterus is not even tender except at the period of dysmenorrhœa.

If the morbid sensibility be propagated from an organ supplied by the sympathetic to a viscus dependent upon the same nerve, the explanation of the transfer has been considered at all times easy, owing to the erratic course and connexion of every part of that nerve.

Again; when a viscus supplied by the ganglionic system, as the heart, participates in the morbid sensibility (with or without pain), affecting a part supplied by a cerebro-spinal nerve, as the hand, the foot, &c., or *vice versâ*, as when diarrhœa produces cramps in the legs, this can only arise from the disturbance being conveyed to the brain or spinal cord either by the sentient, organic, or incident filaments, and from thence to the heart, whereby the pulse is quickened in the progress of inflammatory or other diseases, unless indeed the propagation of morbid sensibility in such instances depend solely upon the universal distribution of the organic or ganglionic system of nerves; in which case we do not require the aid of a separate set of filaments (incident, efferent), or the route of the spinal cord, to explain the difficulty.

I agree, however, in the opinion of Müller, that the so-called *sympathetic* nerve alone, with respect to the sympathies, explains nothing; and that, as the *ganglionic nerve, viewed apart from the sensitive and motor twigs* which accompany it in its wanderings, it has nothing to do with sensation or muscular action; and that it is only the nerve of vegetative or organic life, presiding over the functions of nutrition, secretion, &c. performed by the capillaries (which he expresses by the words "chemische Processe" and "Stoffwechsel—*Handbuch*, p. 648 et seq.)—that it is, in fact, *the true nerve of the capillaries*. It remains to be investigated as to how far the true ganglionic nerve depends upon the ganglia as its source of energy, and for the constant gradual (galvanoid) action which it keeps up in the capillaries in every part of the frame, and whether there be not communications in it throughout equivalent to the anastomoses of arteries, unlike the cerebro-spinal nerves.

The statement of Müller, that the ganglions are the source of the nervous influence of this nerve, and that it has intermixed with it throughout sensitive and motor filaments from the cerebro-spinal nerves, just as it gives also twigs from itself to accompany them, appears to be corroborated by the microscopical observations of Ehrenberg and others.

Notwithstanding what has been said of the dissemination of morbid sensibility from the brain and spinal cord (after it has been propagated to them from any part of the body, or has arisen from derangement of those central organs themselves), it is but an indication by the nerves of its existence there—at their roots; as we cannot suppose the nervous centres to be in a state of morbid sensibility without some of the nerves informing us of it: the sensitive nerves by pain; the organic by excited or disturbed function of the organs supplied by these peculiar nerves; and the motor by partial or general inordinate muscular action. In other words, when the pulse is quickened, the heart itself is not primarily affected, but merely the nervous centres, and the roots of the nerves which go thence to the heart.

Enough, however, has been here stated to account for the symptoms both of pain* and of inordinate action taking place sympathetically, as it is called, without the sympathising organ being diseased; as we see, for instance, occur with the colon, kidneys, and heart, in hysteria and dyspepsia; with the stomach in nephritis, hepatitis, &c.; with the calf of the leg in diarrhœa; with the other muscles in tetanus; and in numerous other instances familiar to all practitioners, and in which diseases, if recent, we apply the remedies to the primarily affected organ; whereas in old cases, where the spinal cord has actually become diseased secondarily, besides the requisite medicines, we are obliged to apply leeches, counter-irritants, &c. over the vertebræ. I have attended many consultations in which discussions have taken place as to whether, in cases of distal pains and visceral disturbances which had indisputably originated from disorder of the uterus, the malady at that period were in the spine or not; the tenderness on pressure and percussion over the vertebræ shewed plainly enough that the spinal cord was physically affected, although at first it had been only sympathetically, *i. e.* functionally. In these cases the symptoms or sympathies, arising from disease of the spinal cord itself have been removed by applications to the spine; but if care have not been taken to cure the latent and deceptive disease of the uterus, the morbid sympathies have soon returned, unless, as sometimes occurred, the treatment adopted cured both spinal cord and uterus simultaneously.

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* The well-known fact, that years after an amputation of the leg, there is a false idea of pain felt in the toes, from morbid sensibility in the nerves in the stump, illustrates this still more strongly, as the apparently sympathising organ does not even exist.

The dependence of pain on disease at the root of a nerve is too often overlooked, and pains of the extremities treated as rheumatism or neuralgia of the part, which are caused by disease of the brain or spinal cord, as subsequently evinced by the occurrence of paralysis.

I must here mention, that I consider nothing can be more faulty than the term (local) "stimulant" applied to rubefacients, such as cantharides, capsicum, croton oil, &c., unless it be the application of the term "increased action of vessels" to the state of inflammation. The former error arose from the latter; for it having been assumed that inflammation was *increased action,* those substances which produced the phenomena were called *stimulants;* whereas, having proved that inflammation depends upon a diminished action of the capillaries, it is evident that they are *relaxants,* either directly or secondarily, and that the real local *augmenters of capillary action* are, cold, astringents, salines, &c., which are also sedatives of the general circulation. The terms *stimulant* and *sedative* should not be used in relation to the local operation of agents upon the capillaries, but as regards their constitutional or general effects, viz. upon the heart and nervous centres; and in speaking of local effects on capillaries, I prefer the terms *relaxant* and *constringent,* as I have shewn that the substances which are stimulant to the heart *relax* the capillaries when circulated to them, and consequently are not local stimulants; and, *vice versâ,* those which contract the capillaries diminish the action of the heart. Referring, therefore, to my former proposition, that the nature of inflammation is intelligible only by considering that the heart and arterial capillaries are acting in opposition to each other (pp. 39, 41, and 98), it follows that whatever increases the action of the one must tend to counteract that of the other. One of the great errors in practice has been that of not attending sufficiently to whether the indication of cure was general—upon the circulation; or local—upon the capillaries. Thus persons have been bled to death for some severe inflammation by those who had their whole attention turned to diminishing the *vis à tergo;* whereas, by sending a certain quantity of a local constringent, such as antimonial, mercurial, neutral, and other salts, combined with colchicum, digitalis, and other vegetable medicines, through the circulation, the capillaries would have been contracted, and inflammation stopped thereby, without shedding so much blood. I have already shewn that these means, besides their local effect, actually diminish the *vis à tergo.*

We have another circumstance also to take into consideration, viz. that the apparently *direct local relaxants* of the capillaries ("rubefacients," "local stimulants,") are only so from intense action; for in a diluted state they are constringent. Weak solutions of capsicum and mustard are constringents; but when concentrated, produce rapidly the secondary relaxation or inflammation, being, in fact, least "stimulant" when they have been thought to be most so.

There is nothing contradictory in these different phenomena being produced on different structures or organs by the same agents, through the medium of the same influence of the nerves.

The action of muscles and of capillaries is produced by the influence of their nerves, but in a very different manner in each: the muscle is made to contract suddenly, analogous to the effect of a shock of electricity;* on the other hand, the contraction of the capillaries is constant, from a constant operation of their organic nerves, analogous to continued galvanic action. In electric and galvanic phenomena the agent is the same, yet how different both in the action and in the mode of production or distribution; the one being sudden, requiring a freedom from damp, the other needing moisture for its production;—as the galvanoid action of the non-muscular capillaries is increased by sedatives, the agents which will stop and destroy the action of the heart and other muscles, and *vice versâ*. Substances which produce the electroid action of muscles, and are hence named stimulants, weaken, and even annihilate, the galvanoid action of the capillaries.

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* At p. 36 I used the term "discharged into them," to suggest an intelligible analogy; it remains to be proved, however, whether, after the shock, the organ be left plus or minus—that is, whether the nervous apparatus has conducted something into or out of it: the decision will not affect the above explanation, as the rationale remains the same.

It will now be seen why the stimulants which increase the electroid power of the heart stop the galvanoid power of the capillaries of the brain. Feel the strong bumping pulse of a half drunken man, whose brain is in a state of childish weakness from the relaxant effect of the alcohol upon the capillary congeries composing the cineritious substance:*—see how much less intoxicating the same quantity of alcohol is in wine, especially red wines (the astringent circulating to the brain with it), than brandy and water of exactly the same strength, and consequently how well known less injurious to the health—excepting in a few cases, where wine disagrees with the digestive organs. May not the advantages of most wines over spirits be attributed to the astringent matters which enter into their composition? Observe the effect of the constringent sedative green tea on the galvanoid capillary action of the brain, when, either from stimulants or fatigue, the latter has become relaxed, and the individual drowsy; the pulse is weakened, whilst the energy of the mind is restored, and continues until, if in excess, the astringent—which had at first contracted the capillaries to a normal state—reduces them below that, and the weakness (delirium) of inanition ensues; just as delirium tremens occurs in drunkards, when the fermented liquor, which the brain had been so long accustomed to, being left off, the pulse becomes weak, the capillaries contract too much; through which the delirium (tremens) of inanition takes place, which may be removed by the administration of stimulants to relax (re-distend) them to their normal state.

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* The operation of alcohol, electricity, and caloric, on the organised union of capillary and nervous tissues, requires still much patient investigation. Electricity and galvanism, which have been alluded to more than once as curative agents, require great caution in their application, lest, by the rapid expenditure of nervous influence, relaxation, instead of action, be induced. The application of caloric even at the present time may be said to be empirical; and as to alcohol, how few years have elapsed since it was discovered to be the remedy for the very disease (delirium tremens) which it induces! When I speak of alcohol, I mean, of course, not in its pure concentrated state, but as it exists in fermented liquors or diluted with water. The operation of these agents on the nerves is transitory, so that any momentary excitement is soon succeeded by the relaxation of exhaustion, unless, as explained formerly, the cautious exhibition of either be modified into a tonic operation. Their action on the capillary organisation is temporarily stimulant, and consequently exhausting. Sensorial actions are electroid—volition, &c.; so are the sympathies from mental emotions—blushing; those of the sphincters from terror, &c. The labours of the phrenologists will probably throw light on these subjects, as well as on the diagnosis of the precise parts of the brain diseased in various paralytic and other affections.

We have uniformly seen that the operation of sedatives is to constringe the capillaries, and in the first instance, independently of their effect upon the *vis à tergo*, to diminish inflammation; so that, however necessary to attend to the heart's action as influencing the pulse,* we must continually refer to the local action of remedies on the capillary and nervous systems when circulated to them. Hence mercury, antimony, and salines which affect the pulse but little, have powerful influence on the capillaries, of the mucous membranes, secreting organs, &c.

We must bear in mind, also, that morbid sensibility accompanies opposite states of the capillaries—either that of over-distension from inflammation, produced by rubefacient relaxants, such as fire, cantharides, or capsicum, or by other causes; or that state of excessive contraction caused by sedatives, such as cold, astringents, &c. This will lead us to the explanation of the "tolerance" of sedative treatment when there is inflammation and fever. When the nervous influence is deficient in consequence of debility, or of the injury of the nervous system which occurs during the symptomatic fever of local inflammation, or during fever from morbid poison, a greater quantity of any sedative agent than is in health capable of inducing contractile action of the capillaries is required either to reduce them to their natural standard and diminish inflammation, or to bring them below it in sound parts; as, for example, when we wish to produce extra sensibility, and its reflex, increased contractility, with therapeutic intentions, as of the mucous membrane of the intestines or stomach by emetics and purgatives, indicated by the desired increase of the peristaltic action, or griping, or vomiting.

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* From what has been above stated, we may understand an apparent anomaly in the effect of digitalis as a diuretic, which was remarked by Withering and others,—that though its effect is to lower the pulse, it failed as a diuretic with patients in dropsy, who had the most strength of pulse and constitution, and acted with those who, from the weakness of their pulse, did not seem to require digitalis. The cause of this is, that the local constringent action of a given quantity of the sedative on the weak capillaries of the kidneys would, of course, be most efficacious when there was the least injecting force of pulse to counteract it; and what has been here advanced will render it evident why, when diuretics fail alone, bleeding, or even active purging, will assist them in producing an effect. I may make another observation upon astringents as diuretics. It is well known that uva ursi and tinctura ferri muriatis are useful for this purpose, when there is gravel in the ducts of the kidneys and ureters, causing, by the irritation of their presence, a congested, inflamed, and consequently swollen state of the membrane, by which the tube is narrowed. The gravel causes bloody urine; here a powerful astringent, the muriated tincture of iron, contracts the vessels of the inflamed membrane, whereby, the swelling being reduced, the tube of the duct is enlarged, the sand, or gravel, is allowed to pass off, and the blood and mucus are diminished.

But when the nervous influence is abundant, as in health, a smaller quantity of sedative will produce that effect upon the capillaries which induces contraction. There is therefore less "tolerance" of medicines in health than in the state of disease for which they are indicated, which will explain an error into which many have fallen, of over-estimating the powers of new medicines:* for instance, a small dose of colchicum given, by way of trial, to a stout, healthy person, will produce a depression far greater than if given to a weak patient labouring under rheumatism or inflammation. A healthy individual will be purged by touching the tongue with the cork of a croton-oil bottle, not swallowing half of a drop; whereas it will take perhaps two or three drops to purge a person who is feverish. This is the case with sedatives, stimulants, and narcotics, where they are indicated to counteract disease. It is universally known how large doses of tartar emetic may be tolerated in inflammatory and febrile diseases, and how little in health, or in chronic affections; as well as the large quantities of opium and brandy which are required to produce an effect in delirium tremens, gout in the stomach, &c. &c.

The griping of purgatives is accompanied by languor, the over-sedatived state of the capillaries producing morbid sensibility, but not inflammation or pyrexia. No doubt, the excessive application of a sedative, as cold, by debilitating the nerves, produces inflammation (chilblain); tartarised antimony does the same externally;

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* It must not be supposed that I consider either croton oil or colchicum really "new under the sun." We have an accurate account of the croton oil in Murray's Apparatus Medicaminum; it was only out of fashion for about a hundred years; and colchicum was described by Dioscorides as a remedy for gout.

and so might *excessive* quantities of drastic purgatives internally. Still, however, danger from ordinary purgatives, which the Broussaians apprehended, does not exist, as the peristaltic motion of the intestines prevents the continued application of the sedative to any one part.* If one grain of cayenne pepper moistened were applied for some time on the back of the hand, it would produce inflammation; whereas ten times as much is taken by some persons into the stomach with impunity, on account of its being mixed with the ingesta, and not applied permanently to any one spot of the mucous membrane. It is the same with croton oil, mustard, colchicum, squill, tartar emetic, &c.

I feel satisfied that Hamilton's work upon purgative medicines was of infinite use, by removing prejudices which had been inculcated by some of the ancients; and that though it has led to a somewhat indiscriminate use of purgative medicine, that has been, in the hands of ignorant persons, an error on the safe side, instead of their resorting perpetually to opiates, which was the empirical mode of giving relief formerly, and by which many inflammations were increased—not by the opiate, but because the deceitful ease obtained caused neglect of antiphlogistic remedies, and thus allowed the inflammation to gain ground. One abuse I consider too serious, however, to omit mentioning; it is the ill-judged administration of purgatives to puerperal females. The uterus, though not in a state of inflammation after natural labour, is of course in a state of morbid sensibility, and the effect of lowering the female by purging is in many instances to make her hysterical; there are then induced sympathetic pains of the abdomen, with tenderness on pressure, flushed skin, restlessness, &c. The inexperienced or ignorant attendant, mistaking these inconveniences for symptoms of inflammation, resorts to the lancet, and other depletion; and the woman becomes more hysterical, with increased pain, debility, jactitation, &c. &c., occasioning serious embarrassment to the practitioner, if nothing worse result.

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* Exceptions, however, to this occur: thus, in one of the numerous post-mortem examinations which have taken place in consequence of the exhibition of quack medicines, lumps of half-softened pills were found collected in considerable quantity in the intestine (colon), where they had produced fatal ulceration of the surfaces on which they had lodged.

Similar evils frequently arise from the injudicious administration of cathartics to hysterical unmarried females.

Persons who are in the habit of taking opening medicines without advice upon every trifling occasion find that a teaspoonful of salts acts freely; but we know that, when feverish, it will require four times as much, combined also with senna, &c., to open the bowels. For the same reason, a very small dose of calomel will nauseate a healthy person; so that those who dose themselves unnecessarily, and have found calomel "disagree with them excessively" when they were in reality well, will often beg of their medical adviser not to prescribe it for them when ill. The practitioner will hence perceive the propriety of not attending to such requests, when his judgment tells him what is necessary.

Delicate people, on the contrary, whose nervous systems are weak, often exhibit great tolerance of purgative medicines, and constantly resort to them; but a free exhibition of tonics, by strengthening the nervous system, will be a much better and more certain mode of keeping the bowels in order. Stimulants will have the same beneficial tendency, provided no feverishness exists. The subject of administration of tonics is very interesting as relating to every-day complaints, such as acidity of the stomach and habitual costiveness. Every one knows that an alkali (as soda), or absorbent (as magnesia or chalk are called), will neutralise acid when it has been generated in the stomach, and relieve for the time; but the way to cure is to *prevent* the formation of the acid by tonics, and nothing better than by an *acid*, such as the diluted sulphuric acid, three times a day, either alone or with quinine or other tonics; and I have frequently cured habitual costiveness by similar means; for instance, by a quarter or half a grain of sulphate of quinine or of iron with myrrh three times a day.

It appears to me that there has been much error with respect to the management of the diet of dyspeptics. Practitioners often restrain them, or they debar themselves, from food which they consider very liable to ferment, such as fruit, vegetables, wine, and beer. The stomach should be cured by tonics, and made to digest such food as is fitted for, and presented to it, by bountiful nature. It is true, that stomachs which have been debilitated, whether by disease or by their natural powers having been exhausted by over-feeding, and especially by indulgence in the stronger wines and spirituous drinks, will permit the development of acid from such food; but this is of little consequence, for by perseverance in the use of proper tonics, such as bismuth, the sulphuric, nitric, and hydrocyanic acids, gentian, cascarilla, myrrh, as in pil. ferri co; balsams, as in tinct. benzoes co. quinine, &c., the most censured articles of food above mentioned will be found useful, as affording the lightest nourishment. Persons who seek to prevent acidity by introducing into the stomach merely plain meat and bread, and drinking dry wines only, do not succeed; for in a short time even these wines, whether port, sherry, or madeira, occasion the formation of acid; brandy and water is then tried, but to no purpose, as these materials will turn intensely sour in the stomach. Moreover, nothing is more injurious than this "regularity" of diet, for the sameness of food produces sluggishness of the bowels, for which the best remedy is variation of diet. Every change of food, sometimes the use of vegetables, sometimes their omission, sometimes wine, sometimes beer, or any other drinks, will prove a fresh stimulus to the peristaltic motion, which languishes when there is no variety. There are no better beverages for dyspeptics than ginger or spruce beer, which have the agreeableness of fermented liquor with scarcely any alcohol. Ripe fruits and lemonade do not produce acidity, but rather refresh and strengthen the stomach. It should be observed, that lemon, though sour, is a ripe fruit, and does not disagree, like sour oranges, or other unripe fruit. I differ from many practitioners, in allowing ripe fruit to persons suffering from thirst in gouty and calculous diseases. These originate in indigestion; and as vegetables and ripe fruit promote digestion and allay febrile heat, they rather assist than retard the cure, besides the refreshment they afford the patient.

From physiological and pathological observation we may deduce, that the nervous influence produces the three phenomena, muscular contraction (voluntary and involuntary), sensation, and capillary contraction. We have seen that some of these phenomena predominate alternately in different parts in the natural routine of life, and under the control of medicinal and other agents. We likewise uniformly see, that when *capillary action* is *arrested* or *diminished*, a simultaneous alteration in the state of the sensitive twigs which accompany the organic nerves of the capillaries is evinced by pain, soreness, itching, &c. Capillary action is stopped in two ways (independently of *mechanical*, *chemical*, or other *destructive* injury); viz. either by depriving the nerves, and consequently the capillaries, of influence, as by extra heat, or electricity, or by rubefacients, relaxants (called local stimulants), such as cantharides, mustard, capsicum, &c. in a concentrated form, which expend it; or, on the other hand, by increasing capillary contraction by astringents, cold, &c. This second cessation of capillary action arises, not directly from the contraction arriving at its utmost; but inasmuch as the capillary action goes on only whilst there is blood in the capillaries, we may infer that, when they have emptied themselves by contraction, the power of contracting also ceases. Excessive action, therefore, produces loss of power, and inflammation *may* result; consequently, after tenderness, which is the first step, we should have redness, distension, loss of power,—congestion. But if the constitution, &c. be in a good state, the temporary suspension of function of the capillaries does not necessarily produce inflammation, whether the suspension of function arise from the application of considerable heat, or a mustard poultice, on the one hand, or from cold, on the other, as we may sometimes see the fingers white and dead, as it is called, from cold, and yet not subsequently inflame, though sometimes they do, producing chilblains. We can understand the *rationale* of all the modifications of sensations which arise—the gentle warmth accompanying blushing—the itching of diminished capillary action in the skin or other part, with congestion or commencing inflammation, increased to pain upon still farther diminution of capillary action; each degree depending upon the accompanying impression on the nerves of sensation.

A reference to the direct or sympathetic operation of the nerves upon the capillaries will guide the surgeon in the application of cold or heat, and explain why excess of cold occasionally does mischief, instead of putting back a tumour, when applied for that purpose. If inflammation exist, as after an accident, in a healthy person, or if whilst the reparatory process is going on, the injecting force of the heart, though natural, be too great for the weakened state of the injured vessels of the part, cold usually gives relief, by constringing the vessels and diminishing the sensibility of the nerves. If, on the other hand, from the constitution being unsound, or from other causes, there be diminished vitality in the part, or a weak, nervous system, warmth will generally relieve, by assisting the weak nerves of the capillaries to keep up the animal heat. Goulard is sometimes too sedative. Tincture of opium, combined with astringents, is useful as a collyrium, in cases where belladonna would be too sedative. I have seen the latter prescribed in cases of deficient nervous energy, where, of course, it produced an increase of the debility, which was subsequently relieved by the more stimulant application. The agents commonly called local stimulants have an effect analogous to heat; for though in excess they expend the nervous influence too rapidly, so as to produce inflammation of a previously sound part, in moderation they are highly useful in some cases of local inflammation, where the nerves are languid; while general (diffusible) stimuli, which produce intoxication and raise the pulse, would be injurious; as we see exemplified in the effect of capsicum in quinsey and scarlatina, in which it is highly beneficial to the mucous membrane as a gargle, or swallowed, when wine would aggravate the accompanying fever, as well as the inflammation, by increasing the *vis à tergo*. This distinction is not in general sufficiently understood or acted upon, and is the reason why students cannot understand how cubeb pepper cures leucorrhœa, gonorrhœa, &c., in which the capillaries of the part are in a state of relaxation. From this misunderstanding, pepper is frequently forbidden as a condiment in various cases where it would be useful in promoting digestion, and preventing flatulence. In order to shew that pepper is not injurious in discharges, I had an artificial cubebs made (combining the terebinthinate and piperine properties), of two parts of juniper-berries and one part black pepper ground together, which I prescribed with the same good effect as cubebs, and induced some other physicians and surgeons to try it also. The beneficial result in several hundred cases was the same as when cubebs had been employed. One reason why pepper had been supposed inflammatory is, that high living is so; but that is not from the pepper which is employed in the made-dishes, but from the wine taken, and over-eating. It has been long known that Ward's paste, so celebrated for relieving the inflammation of hæmorrhoids, owes its efficiency to black pepper. Many are afraid to use cubebs in gonorrhœa; many who do use it would start at the proposal to prescribe pepper as above. The quickest and best cure of the disease I have seen was one where the patient, through a mistake as to the verbal directions given, took cubebs in table instead of tea-spoonfuls, three times a day, and thus consumed two ounces of cubebs, and was perfectly cured, in forty-eight hours. This was not a chronic case, or gleet, but a recent severe one, with ardor urinæ, &c. The prejudices of education make us start at novel facts; but in public institutions, where there are opportunities of prescribing a remedy ten or twenty times per week for years, we can draw inferences which may be depended upon; and when a host of facts are brought forward in evidence, credence is given to the general principles, which would not otherwise receive attention. Ol. terebinth, in doses of from three to ten drops, in mucilage or emulsion, is analogous to cubebs in its action; and I used it for the same diseases, before cubebs was revived, like croton oil, from the old pharmacopœias. The ol. terebinthinæ sometimes irritates the kidneys; and though this inconvenience may be overcome by combining some opiate with it, yet, as the latter tends to confine the bowels, the cubebs, having rather a contrary effect, is preferable to the combination. Creasote much resembles ol. terebinth. in its action, and is even more antispasmodic than the terebinthinate essential oils, as we see by its efficacy in stopping hysterical and other vomiting, numerous cases of which have been published.

We have evidence of morbid sensibility of the nervous system accompanying the cessation of capillary action, whenever a part, however minute, dies. In this instance, not merely the *function* of the nerves in this part is suspended, as above alluded to, but the *nerves themselves* die with their capillaries, and this consequent shock to the nervous system is evinced by chilliness and shivering. Shivering, called rigor, is a most constant accompaniment of the formation of abscess, and has usually been attributed to the formation of pus; but it is the forerunner of suppuration—not depending upon it, but upon the death that precedes it; for the formation of pus is part of the process of reparation (see p. 58); though, if it be confined so that it cannot escape, and be not absorbed, it will, as it accumulates, produce by its pressure additional destruction.

The progress of ABSCESS is as follows: a portion of areolar tissue, gland, or other inflamed part, becomes disorganised—dies, accompanied by shivering; the process of reparation by granulation begins, but as the pus from the granulations cannot run off, as when upon the surface, it is collected, causing a tumour. If this pus be not absorbed as fast as it is secreted, distension takes place, and the pressure of the pus, in consequence of its fluid nature, will be greatest towards the point where there is the least resistance, viz. the nearest surface, modified by the bone and fascia in the parts. When the pressure towards the surface is so great as to stop the capillary action of the parts pressed upon, another layer of the soft parts dies. There is usually a renewal of shivering during this progress of the abscess to the surface, which is called pointing; and as the constitution sometimes suffers much from this repeated destruction of parts, it might be thought that it would be beneficial to anticipate the natural exit of the pus by making an opening; but the objection is, that if the pus be not allowed to make its own way, at least till it nearly reaches the surface (during which the floor of the abscess is, under favourable circumstances, rising from the growth of granulations), the healing will be a very tedious process, owing to the depth of the wound; though this lesser evil must be disregarded if the constitution be suffering from the renewal of rigors and accompanying hectic. Rigors, therefore, may be observed in a variety of cases of cessation of capillary action,—as when a spot of areolar tissue dies, which is always the case in the common boil (furunculus). In carbuncle, which is but a gigantic boil, we may know when the disease is spreading or burrowing, by the patient experiencing a rigor, and on the following day it will be found that the margin has enlarged. These are the phenomena of abscess, of whatever size—whether a pustular pimple, a boil, a carbuncle, or a deep-seated abscess arising from various causes. In the commencement of erysipelas, in which there is a loss or cessation of capillary action, though the part may not die, shivering occurs before any alteration of the skin is perceptible, of which, upon examination, the surface will thus early be found tender and painful, as in shingles (herpes zoster). That there is a certain degree of destruction of the surface of the rete mucosum, is rendered probable by the subsequent separation of the cuticle.

There is no real difference between PHLEGMONOUS and ERYSIPE-

LATOUS *inflammation;* it is the same inflammation in both cases; the variation is in degree or situation. If there be no death of part, there will be no slough, no loss to repair,—no necessity for the suppuration which accompanies granular reparation,—but merely desquamation of cuticle, or even resolution. The stages from a slight erysipelatous blush to the most violent inflammation and sudden mortification do not differ but in degree—analogous to the difference in degree of the action of fire, from a slight scorch to the actual cauterization which instantly causes the death of the part: the intermediate stages resembling the action of a moxa, or German tinder which scorches more or less, as may be desired; producing, as it were, the erysipelatous inflammation, either slight, followed by desquamation, or more severe, with immediate effusion of serum or lymph, and separation of the cuticle; and if still more potently applied, causing a slough, as *erysipelas* sometimes becomes carbuncle; whereupon it is called *phlegmonous;* the two things which produce the sum of the phenomena being the injury and the constitution—great injury with little debility of constitntion inducing the same result as less injury with greater debility. Thus we see the feeble Lascar, brought into the London Hospital, with limbs mortified by a degree of cold which the English bear with impunity. Again, inflammation, which would be erysipelatous and superficial in a moderately strong constitution, becomes carbunculous or phlegmonous in a debilitated one. We also find, that the various degrees of the same inflammation, which arise on the backs of persons confined to bed, are in proportion to the debility of the nervous system. In fine, I repeat, there is but one inflammation—loss of power in the capillaries—of all grades, from mere loss of tone to actual decomposition—melting away (p. 60). If we subject a steel spring to a blow-pipe heat, or the powerful agency of a galvanic apparatus; first, its elasticity is destroyed, then it begins to give way and bend with its own weight, and lastly it melts: we have in these analogous cases a tissue and an agent, and we witness similar effects in both, from the slightest diminution of tone or tenacity to actual decomposition and melting away.

Although astringents, by contracting the capillaries, usually relieve inflamed parts, yet applied in excess they may cause morbid sensibility, evinced by pain, and an increase instead of diminution of the inflammation. The administration of sedatives also, in excess, produces morbid sensibility; as, from their taking off the injecting force by diminishing the action of the heart, like blood-letting, the capillaries in the organs, generally, will contract too much, and morbid sensibility result; hence frequent contractions of the heart; whilst at the same time, from the diminution of the circulation of blood (the appropriate stimulus), each contraction will be weaker. Thus blood-letting often makes the pulse quicker but weaker; so do digitalis and antimony under some circumstances, as mentioned page 77, where there is debility; but in the natural state of the system, their effect on an *over-acting* heart is to make the pulse slower; The effect of a sedative or bleeding upon the *natural pulse* is to make it at first slower; then, when morbid sensibility and debility come on, the pulse becomes quicker (flutters); and in animals bled to death, the morbid sensibility produces convulsions; as occurs also from a poisonous quantity of digitalis, or hæmorrhage from a wound, or flooding in parturition. The rapidity of pulse and convulsions from hæmorrhage are a beautiful "provision of nature;" the heart sends on what little blood reaches it, so as to sustain life to the utmost, whilst the convulsions of the frame help to propel the blood in the veins towards it.

The pain in the back or head produced by hæmorrhage, by the sedative operation of bleeding, digitalis, or antimony, is caused by morbid sensibility from over contraction of the capillaries, in consequence of deficient injection of arterial blood. The nausea and vomiting which follow blood-letting, or the administration of sedatives, result from morbid sensibility of the stomach produced in the same way.

This will account for cathartics being assisted by emetics, and both by bleeding: the operation of a cathartic is sedative, producing local morbid sensibility, and consequently* increased peristaltic motion; and if a little ipecacuanha or tartar emetic (which are also sedative) be added, the operation will be more certain. Bleeding has the same sedative effect, especially if there be hard pulse from inflammation; but, as mentioned above, does not alone produce morbid sensibility, until it reduces the pulse below par, though it co-operates with the medicines; and, on the other hand, if there be diarrhœa from inflammation of the mucous membrane of the intestines, bleeding will diminish the purging by diminishing inflammation; which explains the adage of Celsus, that bleeding relieves obstinate purging as well as obstinate costiveness.

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* We have abundant evidence that pain, irritation, or morbid sensibility without pain, produces or increases action in the muscles (voluntary or involuntary) in its neighbourhood; for example, tic douloureux, gravel in the bladder, ipecacuan, tartar emetic, sulphate of zinc or copper, or inflammation in the stomach, jalap, and other purgatives, or inflammation of the mucous membrane in the intestines.

But it must at the same time be remembered, that too great a degree of sedative operation on the intestines will produce morbid sensibility and spasmodic contraction of the peristaltic muscles—so strong, in fact, as to close the tube by spasm, called colic, which we see result in the painter's colic from the sedative effect of white lead. An unripe apple, or other fruit, produces a similar local sedative impression on a part of the colon, so that pain (griping) and spasmodic contraction result, by which the offending substances and fæces are prevented from passing. It is well known that purgatives and other sedative treatment will not cure colic; on the contrary, they increase the tormenting griping, with the misery of sickness in addition, when administered by those who think only of a "stoppage of the bowels," and purgatives to overcome it. Stimulants, with narcotics, the warm bath, and warm aromatic drink, with opium, especially in enema or suppository, will relax the colicky spasm of the intestine, and most likely produce an evacuation of the bowels; but if the latter does not occur; as soon as the spasm (of which pain is the evidence) has been perfectly quieted, a little castor oil will operate. Here, again, we have examples of the apparent contradictions which occur in medicine—bleeding both opening and quieting the bowels, allaying or inducing morbid sensibility, according to circumstances. We see the peristaltic action, the office of which is to transmit the fæces, actually obstructing their passage, by being inordinately increased—purgatives adding to the obstinacy of constipation of the bowels—opium relaxing them: in short, the same morbid sensibility from sedatives producing the opposite effects of purging and constipation; and yet that all these contradictions may be reconciled upon rational principles.

As a third case or degree of disease, let us consider the local affections, such as inflammations of the eye, lungs, or bowels, &c.

when they are either too great to yield to the remedies applied, or when they have been neglected, thus keeping up the morbid sensibility of the nervous system; so that, in addition to the increase of pulse, we have other evidence of disturbance in the functions of the nervous system, and in the digesting system, &c. through it. Hence, pains in the head, back, and limbs, with lassitude, or a feeling of weakness, shewing that the nerves of sensation and voluntary action are affected; alteration of temper; hurry of thought, not indeed amounting to delirium, yet enough to shew disturbance of the functions of the brain; want of sleep; wrong perceptions, such as fancying disagreeable smells; chilliness; morbidly increased heat of the skin, with dryness, shewing want of tone from deficient nervous energy,—for as long as the vessels of the skin are kept in order by the nerves, the secretion of insensible perspiration preserves it cool and soft. The digestive system is now also deranged, the sympathetic nerves partaking of the morbid sensibility, as well as the cerebral and spinal nerves, and of course the organs supplied by them; there is loss of appetite, and imperfect secretions in the primæ viæ, causing thirst, frequent nausea, and deranged functions of the intestines—constipation, or diarrhœa. The kidneys also evince a loss of power, their secretion becoming dark, reddish and scanty, as before explained (p. 49).

The combination of symptoms here enumerated constitutes what is called *constitutional disturbance*, or SYMPTOMATIC FEVER (*pyrexia*), from local inflammation: and we have traced them successively from the local injury to the constitutional affection: we have observed a part, which we have known to be inflamed, deranging the functions of the brain and nervous system, and consequently the functions of the various organs—the skin, heart, stomach, bowels, kidneys, &c. The symptomatic inflammatory fever might be called *symptomatic synocha.* It is the same assemblage of symptoms which forms Cullen's definition of the *idiopathic* disease SYNOCHA, viz. heat much increased, pulse frequent and hard, urine red, the sensorial functions but little disturbed, and the power of voluntary motion diminished. The idiopathic synocha sets in, in Cullen's words, without primary (or preceding) local disease; that is to say, the symptoms of lesion of the nervous system are not preceded by any hurt, or local inflammation, or pain, external or internal; but the lesion of the nervous system in idiopathic fever is, in fact, the local disease. It is, in my opinion, the nervous system itself which, being injured, produces synocha, or idiopathic inflammatory fever; as it arises in hot climates, and in this country in the heat of summer, in labourers exposed to work under the heat of the sun; or sometimes from the opposite cause of excessive cold, combined with deprivations, excesses, depressing passions, or other causes of injury to the nervous system, by infection or by epidemic influence, as is the case in the synocha petechialis.*

The treatment in both these fevers, the idiopathic and the symptomatic, is the same, viz. bleeding by the lancet, leeches, or cupping; low diet and rest; attention to the bowels; sedative antimonial, or other emetic or diaphoretic medicines; and the use of local applications. If the inflammatory fever have arisen from an inflammation which has been brought on by a blow or other injury, as a fracture, or from an inflamed tumour in the mamma or groin, or an inflamed arm and axilla after a puncture of a finger—local applications of leeches and poultices, or lotions, are employed: if the inflammation be in the chest or abdomen; in addition to general means, we must use leeches, fomentation, blisters, poultices, &c. If the inflammation be in the integuments of the face and head, in form of erysipelas; lotions, or other similar applications, and blisters should be applied close to the part. If it be idiopathic synocha, still, along with general remedies, we should have recourse to local applications—cold lotions applied to the head, with leeches and blisters, &c., to relieve the inflamed brain or meninges, if the head symptoms predominate; or leeches, &c. to the chest or abdomen, according to circumstances. Sponging the skin with water, either tepid or cold, also produces a sedative impression on the circulation by cooling the blood, and a constringing effect upon the capillaries.

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* In the year 1831, several cases of fever were published in the *Lancet*, in my clinical lectures, which shew the benefit of antiphlogistic treatment in fever. Besides some cases which corresponded exactly with Cullen's definition of typhus, there were others that were what many at that time called typhus, but which did not agree with that definition: they were cases of Synocha petecchialis, which has since occasionally been more or less prevalent in London. I took the liberty of naming it *S. petechialis*, as the term "febris nova," by which Sydenham describes it, is too vague. The modification of symptoms is merely one of those changes in the constitution of an epidemic which have been so well and frequently described by Sydenham. In the numerous cases which occurred during 1837, the "constitution of the epidemic" had changed, there being a greater preponderance of gastric than thoracic symptoms; and I may also mention the coincidence, that the cases of influenza in the ensuing spring had less of the pulmonary or bronchial character than usual, and assumed in many instances a marked remittent type. The Synocha petechialis is often not distinguished by practitioners, though the spots are different from typhoid petechiæ, being more of the colour of measles. The analogy of treatment holds good, also, as the bronchial and pulmonary affection accompanying it frequently requires venesection, as in measles.

In the instances hitherto adduced the practice is straightforward, and the indications of cure evident: viz. to use local applications, to correct disordered functions, and to lower the force of the circulation, so as to diminish the current of the blood into the inflamed part, by blood-letting, sedatives,* &c.; the necessity of which is agreed upon by those who look upon the throbbing of the arteries as an evidence of increased arterial action, as well as by those who agree with the opinion which I entertain, that it is only an evidence of increased action in the heart, and deny that there is increased arterial action in inflammation, whether the pulse be strong or weak.

Slight pyrexia (feverishness) will arise, from local causes, which must be treated without too much attention to the pyrexia, as general remedies would exhaust and weaken without affecting the local disease; for instance, that from hæmorrhoids, teething, intestinal worms, hysteria† (chronic hysteritis).

We now come to consider the fourth stage of disease, when, after the foregoing state has existed for some time, the power of the nervous system becomes exhausted by morbid sensibility, want of nutrition, &c.; and when the heart, though still under the influence of sympathetic morbid sensibility, deriving less energy from the debilitated nervous system, and being also less nourished, has less power to contract, and really becomes weaker; the pulse, therefore, though still perhaps hard, is rendered weaker also. Sometimes the brain, from the same causes, becoming inflamed, or at least congested, has its functions more impaired, and the thoughts become more confused, until actual stupor, or delirium, succeeds; and the pulse, losing even its hardness, becomes soft and weak. The heart being now unable to empty itself, the circulation through the lungs is retarded, and there is a tendency to congestion, from their capillaries being also deficient in power: the blood therefore not being purified, causes still greater stupor, and the patient is said to be in a state of typhoid (stupid) or low fever; instances of which may be seen in local inflammations from disease or injury, as when there is inflammation in the chest or abdomen, or after wounds or operations, where the sympathetic fever becomes typhous (typhoid). But if the brain does not become inflamed or congested, the patient may die from mere exhaustion, with all the senses perfect, as in *hectic* fever.

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* It must not be forgotten that the sedative medicines, salines, antimonials, mercurials, &c. also reach the inflamed capillaries themselves through the circulation (p. 70), producing an astringent effect upon them.

† I consider the cause of hysterical symptoms to be chronic hysteritis, yet by no means frequently requiring the sedative antiphlogistic treatment; most commonly the tonic antiphlogistic, often the stimulant antiphlogistic (p. 98.) The chronic hysteritis producing hysteria is often as slight, though not so transitory, as that which Hunter shewed to accompany conception, but which frequently lasts through pregnancy more or less. From not referring to this source, the notions entertained of hysteria have been very vague.

Or, we may see a patient with symptomatic typhous (typhoid) fever, without having had any previous strength of pulse, and with a cool skin, as from local injury; when, for instance, with the injury, the nervous system has received a shock, as in the case of a severe accident or of an operation. Thus we may trace the progress from smaller injuries and their consequences to greater; a slight inflammation with morbid sensibility, as a single inflamed hæmorrhoid, produces shivering and heat of the skin, *feverishness* (*pyrexia*); the spreading of this inflammatien to a greater portion of the intestine producing *symptomatic inflammatory fever* (symptomatic synocha); and a still further extension of the mischief, general inflammation of the bowels, will bring on *typhoid fever*, with oppression of the sensorium.

Now, by a similar series of events, the synocha, or *idiopathic* inflammatory fever may also become typhous, which is Cullen's synochus, a fever "beginning with synocha and ending with typhus."[*]

"It is a common error to think that strength of pulse *necessarily* exists in synocha. The term synocha does not even imply it, as its Greek signification is merely *continued;* neither has τύφος (*typhus*) any reference to the state of the pulse, but merely to that of the sensorium. Hippocrates applied it to a stupid or comatose state, in which the patient stares without answering, like a person who is haughty or prond, which is the meaning of τύφος: the other possible derivation, τύφω or τύφομαι, having reference to a half-kindled smoking or smothered fire, which could only allude to the low temperature of low nervous or typhous fever, in opposition to the calor mordax of inflammatory or synocha fever.

Cullen therefore divided unnecessarily, according as it might terminate, one fever into two. It is the "common fever" of this country, Sydenham's "new fever," the synocha, or S. petechialis, which, whether the petechiæ be visible or not, ought never to have been called synochus, much confusion having arisen from the use of this term.

We have what is called *idiopathic* TYPHUS without any previous "synocha," and with the temperature, from the beginning, even below the natural standard; as when the brain and nervous system are poisoned by contagion, or by concentrated foul human effluvia, as in gaols, transport or slave ships, &c., either with or without predisposing circumstances of over-fatigue of body or mind. Is typhus or typhous fever an affection of the cineritious substance,—synocha of the investing membranes of the nervous system?—analogous to the difference between inflammation of the substance and membranes of other organs, as between peripneumony (inflammation of the substance or parenchyma of the lungs) and pleurisy (inflammation of their membrane), enteritis (of the intestines) and peritonitis (of their investing membrane), &c. &c. Disease of parenchyma more completely interrupts the function of an organ than that of its membranes, though inflammation of the membranes produces distuabance of action and pain. In typhus, we see the functions of the nervous system, thought, volition, and sensation, especially interrupted. The difference may, however, consist merely in the degree of inflammation or of congestion of the cineritious substance.

Typhus and typhous disease are generally considered more difficult to treat than synocha, the indications of cure more complicated, if not contradictory; and medical practitioners are more at variance in their mode of attempting to remove the symptoms. Here, however, as in the former instance, attention must be paid to the local affection; but, above all, in the idiopathic typhus, lotions to the head, to constringe and give tone to the vessels of the brain, and leeches to relieve the congestion, are the essential local applications, and the most unequivocal remedies in our power. Besides local applications, due attention must be paid to the alvine and renal secretions; but the most important question is, as to the administration of stimulants, or of sedatives and depletion; and it is only by careful observation of actual disease at the bed-side that we can arrive at the knowledge necessary to guide us.

Those (the Brunonians) who looked upon the typhous state as one of debility (which it really is), but considered *only* the effect which stimulants would have on the healthy frame, and that they are often useful and necessary in surgical and other cases, where there is much debility, resorted to wine and tincture of opium in typhus fever, not considering that the disease always included a diseased state of the brain and nervous system, and that though, in some instances, the stimulant might be borne with impunity, yet, that by increasing the action of the heart, the vessels of the brain, spinal cord, &c. would be still more injected, independently of the specifically injurious effect of the stimulant on the capillaries of the cineritious substance. In fact, experience proves that cold to the head, with moderate saline and other sedative medicine, will cure typhus, or prevent the typhous state from occurring in synocha; whereas when wine, with or without opiates, is employed, the disease frequently proves fatal. I had one very useful opportunity of seeing the contrast of the different modes of practice during the fever which prevailed in Italy in 1817, the proportionate mortality being very much greater in an hospital where the stimulant practice prevailed than in that under the direction of Dr. Aglietti, in Venice, who, I suppose out of compliment, called his manner of practice the English, consisting of "contra-stimulants" (sedative evacuants), antimony salts, purgatives, &c., internally, with the external application of cold water and free ventilation. But though the British may have commenced a similar practice at the same time, the adoption of sedative ("contra-stimulant") treatment in typhus was not introduced into Italy by them, but by Rasori; and that, too, in opposition to the stimulant Brunonian practice which he had learned in Britain.

We may understand the risk of stimulating a typhous patient, by supposing that when an important organ, such as the lungs or brain, is inflamed, or even congested, the weak pulse of the typhous state of collapse, during peripneumony or typhus, may be one of the provisions of nature to allow the parts to recover, as they would during the collapse of syncope produced by bleeding; and, of course, when so important an organ as the brain itself is diseased (as it is incontrovertibly in the typhoid state), we should be careful how we set the heart pumping more forcibly than necessary. The opposite extreme should not, however, be adopted, and the patient be permitted to die for want of a spoonful, or even a bottle of wine or brandy for the quantity must be relative, depending on the effect), if there be real danger of sinking at an advanced period of the disease; and when the rallying point is gained, caution is necessary not to push them too far. There is languor and lassitude in all fevers; but the symptoms of sinking, requiring stimulants, are, fluttering, weak, soft pulse; cold sweat; lying on the back; respiration oppressed; involuntary dejections. Wine, on the other hand, will not agree whilst the pulse is hard or sharp, and the skin decidedly dry, even when there is subsultus tendinum and prostration. Ammonia should be tried before resorting to wine.*

The functions of the primæ viæ are so uniformly disturbed in fever (symptomatic or idiopathic), that it is not surprising that Broussais, an accurate observer, should have fixed upon the mucous membrane of the stomach and bowels as the seat of the immediate cause of idiopathic fever; but I think it has been satisfactorily shewn that fever is lesion of the nervous system—if commencing there, from malaria, contagion, &c. idiopathic; if induced there by inflammation of other organs, symptomatic. Some inflammations of the viscera arise during fever, and are very truly said to be produced by the fever; that is, the *organ having been predisposed* to disease, when robbed of its due supply of nervous energy by the derangement of the functions of the nervous centres, its vessels fall into the congested or inflammatory state; and when the cerebral symptoms diminish, if not before, it is observed to be affected. This is the case most frequently with the mucous membranes of the intestines and lungs in temperate climates, and with the intestines and liver in hot climates; so that many doubt whether the fever produce the hepatitis, or the hepatitis the fever; or whether the inflammation of the mucous membrane induced the fever, or the fever the inflammation of the mucous membrane, as in acute dysentery. Sometimes the disease in the first instance is the fever; but even then the brain has been rendered more susceptible of the exciting causes of fever by the previously debilitated state of the organs—the liver, the bowels, or the brain itself; and the moment the fever begins, the inflammatory or congested state of the organ is increased and rendered evident, though previously latent.

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* I have not mentioned ammonia as a part of the treatment of the Brunonians, though it was used by them along with wine and tincture of opium; because ammonia is *not*, like these, a diffusible stimulant. In the first place, ammonia is used empirically by the most able of the profession, in cases where they know from experience that they must not employ wine or tincture of opium. This alone shews that it is not really a diffusible stimulant—it is a local one in the stomach; and as such, through the medium of the solar plexus, excites the heart momentarily, though not injuriously. Again, so far from being a diffusible stimulus, it immediately unites with animal acids and then circulates or is *diffused*, not as a stimulant, but as a *sedative* saline; so as to perform the double operation of a temporary local stimulant to the stomach and heart, and a sedative astringent to inflamed capillaries elsewhere, although the latter indication has not been generally contemplated in its administration.

From the very nature of FEVER, which I have described to be a disease essentially affecting the whole nervous system, it follows that the functions of the viscera must be disturbed; and though, as just pointed out, sometimes disease of one organ predominates, sometimes of another, yet *every organ* suffers more or less congestion in *every fever*, from the loss of nervous influence. Hence those who are advocates for fever being a something that pervades the whole system, say, you cannot refer it uniformly to any one fixed seat; and, on the other hand, those who have taken up the notion of fever being located either in one organ or in another, seldom or never fail, in post-mortem examinations, to find proofs of their own opinions; for, as no organ escapes disease, that which is sought for will be found, whether the opinion of the author lead him to anticipate "cerebritis," "gastro-entiritis," or "pulmonic congestion." The temporary congestion of organs during the febrile state affords an explanation of the obstinacy of some agues: in bark and arsenic we possess certain remedies for the poison of simple ague; but when cases resist these means, practitioners resort with success, one to the lancet, another to mercurials, a third to leeching the epigastrium, &c. The cause which prevents the cure of the ague is visceral disease, which may either have existed before the intermittent, or have arisen during its continuance. The ague and visceral disease, whether of bowels, liver, lungs, or spleen, &c., act reciprocally as cause and effect—the ague aggravating the visceral disease by causing congestion during each paroxysm; the visceral disease, by keeping up morbid sensibility during the intermission (or even a pyrexial state between the paroxysms, when the disease is named remittent), which prexents the cure; but if, by mercury, or bleeding, &c., the visceral disease be removed, the cinchona exercises its influence on the nervous system, and finally arrests the disease.

We can understand the origin of the former unjust prejudice against bark. Physicians found that visceral disease sometimes remained after ague was cured, which was attributed to the bark "causing obstructions;" and it must have often been fortunate for a person suffering under a combination of visceral disease and ague, that, from the bark failing, recourse was had to mercurials, or to those remedies which cured the visceral disease, but which many called helping the bark. In this manner arsenic often acts as equivalent to a union of bark and mercury; for arsenic, besides its tonic effect on the nervous system, increases the secretion of bile, and otherwise acts on the liver: it possesses also the power, like mercury, of curing chronic inflammations; and even further resembles it in occasionally producing the inconvenience of salivation.

Considering disease, then, as depending on the conjoint affection of vessels and nerves, and knowing what agents will influence their actions, we may in our practice always have a reason for the application of remedies, and be able to combat such cases as we may not have before seen or heard of. Acute diseases are those in which the feverish or other constitutional symptoms are the most urgent, threatening life. Chronic diseases prove fatal only when the gradual alteration of some organ undermines the constitution by interrupting some of the nutrient processes—as in hectic or marasmus, from disease of the mucous membrane of the intestines, or from slow disorganisation of the lungs, liver, &c.

Men who consider themselves opposed to each other in theory, coincide nevertheless in the essential points of practice; as Armstrong, Broussais, Clutterbuck, Frank, Hamilton, Rasori, Stieglitz, Tommassini, and others. The object being to diminish local inflammation, congestion, or by whatever name the local disease may be called, and to counteract the derangement in the organs of circulation and digestion, all agree upon the necessity of rest, diet, and unloading the lower intestines; I might perhaps say, that all agree upon the propriety of abstracting blood, either by leeches or otherwise: they differ as to the use of drugs. Broussais says that the others irritate the mucous membrane by emetics and cathartics, though he does not entirely neglect to empty the bowels by enemata; but as this mode of opening the bowels does not produce such a sedative controlling influence on the circulating system, &c. as the cathartic and emetic substances, he is obliged to abstract more blood by venesection or leeches. The others may object that this loss of the pabulum vitæ does more harm than the drugs. One man treats fever by venesection, leeches, diet, and scarcely any medicines: another by abundant use of them (calomel, &c.), with external application of cold water, and perhaps the extraction of little or no blood. One man deprecates blisters, because he may have seen them applied by very unskilful practitioners, and put on in pairs in cases where the patient died in consequence of other causes; but we almost all know that blisters are useful in very many cases. There are medical men in this country who appear to me almost to coincide with Broussais in his opinion as to medicines irritating the mucous membrane, and who object strongly to repeated doses of calomel and purgatives in febrile complaints, and say that emetics act on the principle of counter-irritation. It is interesting to observe how various writers confirm my opinion of emetics being sedatives; and the practice of the "new Italian school," which considers them to be contra-stimulants, acting like venesection in controlling the circulation; as Clutterbuck, for instance, says, that he "found emetics have a beneficial effect, before he knew the value of venesection in fever."

The state of low or typhus fever being in reality debility, it is difficult for the beginner to satisfy himself of the necessity, or even the safety, of using sedative, evacuant, and diaphoretic remedies; nevertheless, all who have experience (except the Brunonians) allow its expediency, in whatever way they may explain it; and it is necessary to be as well assured as possible on this point. The student can more readily be convinced of the necessity for depletion in a state of complete prostration produced by inflammation of the lungs or other organs; because he can understand the cause of that state to be, that the capillaries of the organ are overloaded, and that by lightening them, their power of action may be restored. But the low fever being thought to have no fixed habitation, and being considered as a something pervading the system, the rationale of treatment is found not so evident. Fever pervades the frame, it is true, because the nervous system, which is its seat, pervades it. The phenomena of idiopathic fever shew that the nervous system is first implicated—debilitated by a morbid poison from the first: hence the necessity for relieving the debilitated congested capillaries of the nervous centres by sedative treatment (p. 70, l. 26): in addition to this, as post-mortem examinations prove that there is uniformly more or less visceral inflammation accompanying typhus, the expediency of an antiphlogistic treatment becomes more obvious.

Although the fevers produced by local inflammations, symptomatic fevers, closely resemble the idiopathic fevers produced by infectious effluvia, there is in the latter a more immediate impression on the nervous system, caused by the morbid poison of the infection, independently of the inflamed or congested state of the capillaries of the nervous centres, which exists alike in both symptomatic and idiopathic fever. And though symptomatic inflammatory fever may resemble idiopathic inflammatory fever as much as the inflammatory eruption produced by tartar emetic resembles the idiopathic eruption of small-pox, yet there is more lesion of the nervous system in idiopathic than in symptomatic fever: there is, as it were, some chemical or electric effect produced by the poison; and the duration of the violence of the fever appears to be in proportion to the power of the dose of poison received. We see that one morbid poison produces fever followed by small-pox eruption; another produces fever followed by the carbuncles and abscesses of plague; and that the severity of the disease is proportionate to the dose of the poison, allowing for the state of the constitution; for there is mild plague, as well as mild small-pox, or mild Asiatic cholera; there being all degrees of those diseases, from that which kills in three or four hours, to that which never confines the patient to bed, but allows him, on the contrary, to attend to his business with a carbuncle, or inguinal or axillary abscess of plague; or a few spots of eruption of small-pox; or the diarrhœa of slight cholera. Continued fever, remittent fever, and ague, also differ in degree according to the strength and dose of the poison—from the mild ague, synocha, or typhus, to those severe cases which prove fatal in a few hours; from the mild agues and remittents of this country, to those of hot climates, which are fatal in the first, second, or third paroxysm. If the dose of poison has been too great, it will stop the machine, unless remedies can be applied to relieve the parts most oppressed, until the nervous system recovers sufficiently to renew or re-secrete that influence, the power of doing which is diminished by the poison, and without which it cannot impart energy to the organs.

One thing necessary to the recovery of the nervous system is arterial blood: to produce this of a good quality, digestion and free respiration are requisite; yet, in fever, from the loss of power in the nerves, the process of digestion is imperfect, and the lungs become congested.

The digestion having been disturbed in the first instance, the food which was in the bowels becomes thereby spoiled, and must be removed by purgatives, as from its undigested state it cannot furnish good nourishment, even if it do not prove a source of irritation; it is therefore useless to supply other than fluid nutriment,* until some renewal of nervous energy takes place. This restoration of nervous energy will not be expedited by stimulants; for in whatever way the cineritious tissue generates nervous influence for the supply of the medullary, time is required for the process, as during sleep. Experience teaches that stimulation, except during a state of inanition, only oppresses; whereas it is acknowledged that in fever the opposite state of the capillaries exists—plethora, active or passive. The lungs being congested, it is useful to take away some blood, by which the remainder is better arterialised, and is thus more adapted for the restoration of the nervous system; besides which, there is in inflammatory fever a direct indication of the necessity of bleeding, to relieve the inflamed parts, whether the brain itself or other viscera be the seat of the inflammation.

As in fever, the nervous system and the functions of digestion, secretion, circulation, and respiration being weak, universal debility appears to exist, great difficulty is experienced in rendering the advantage of bleeding and other sedative remedies evident. But how different is the sudden functional debility in fever from that real debility of the frame induced by starvation, wasting disease, loss of blood from a wound, &c.! Febrile debility is relative, in consequence of which the ordinary quantity of blood in the system becomes disproportionate and oppressive, more especially as it is at the same time deteriorated.

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* I have found milk the best, either alone or mixed with gruel, arrow-root, or cold water, according to the taste of the patient.

Under these circumstances, the object is to restore the strength of the nervous system; stimulants, however, do not effect this, but, by temporary excitement, tend still further to exhaust it: a gradual supply of arterial blood can alone suffice for its recovery. Were we even to suppose that the heart were still capable of being stimulated to increased action, it is evident that increased action only tends to overload the congested capillaries of the brain with blood, which, from the congested and adynamic state of the lungs, has been less perfectly arterialised, as is shewn by the lividity of the lips, dusky colour of the skin, &c.; oppression of the nervous system is thus increased, and matters aggravated, so that the animal powers necessarily begin to decline. But the heart is not always capable of being stimulated to increased action—it is really weak in typhus, from deficiency of nervous influence; stimulants may increase its sensibility to the presence of the blood, causing it to make more, though inefficient, effort; so that it struggles against an overload, and thus only becomes more exhausted. As stimulants do not give power, but only elicit that which exists, the entire system, and the heart in particular, in typhus, may be compared to a tired horse in a loaded cart, reaching the foot of a hill, but unable to ascend it; the stimulus of the whip may make him struggle to the attempt, but, if urged, he will at length sink: if, however, some of the load be removed, he can ascend the hill: and if some of the load of blood be withdrawn, the pulse will rise, as is well known and admitted in its sunken state in severe inflammation of the lungs or bowels, but which is not so generally acknowledged in fever, where bleeding is, nevertheless, sometimes resorted to, either on account of the fever itself, or some of the "complications" of local inflammation of the head, chest, or abdomen. But, again, if the horse, without being either stimulated by the whip or having his load lightened, be allowed to rest, he will be able to ascend; and thus often without either stimulating on the one hand, or venesection on the other, the heart will recover, and the pulse rise.

This leads to explanation of the manner in which saline, antimonial, and other sedative or antiphlogistic medicines, and means, such as cold externally, and bleeding, are beneficial in fevers, both when the pulse is *too strong* and where it is *too weak and rapid.* In both cases, sedatives, by repressing the expenditure of nervous influence, cause the heart to struggle less, and take repose.

At the same time, the action of the capillaries throughout the frame being increased, by the constringing property* of the sedative circulated to them, the nervous system recovers powers. Thus febrifuge sedatives minish the coma of plethora which exists in typhus, and which results, not from overpower of the heart, but from weakness of the capillaries of the nervous centres; and it is thus that they become powerful allies of bleeding, or even substitutes for it, in cases and stages where bleeding is either not necessary, or contra-indicated.

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* I have formerly spoken of the tonic operation of mercury in chronic diseases: its antiphlogistic property in acute inflammation is also universally acknowledged, which antiphlogistic property I call sedative; and as a sedative it is by many considered most valuable—nay, indispensable—in bad fever. It is highly valuable, but not much so as antimony and the neutral salts, and certainly not indispensable. To prove this to my pupils, as some were to practise in the naval or military service abroad, and might have the misfortune to be left without calomel, I undertook to shew them how to cure fever without its assistance, and took the next dozen of cases as they occurred—some very bad, some middling, and some slight. We lost but one, an old person, who had very mild fever, but died of a previously diseased state of the lungs, as we ascertained by post-mortem examination. This was no experiment, but a demonstration of the truth of principles well established. The remedies employed in these cases were, in some bleeding, in all tartar emetic, with sulphate of magnesia and senna in addition, when required. I commonly use calomel with the other medicines in fever, when indicated as already explained in various passages; but one medicine may be substituted for another. It is proverbial that an experienced workman does not find fault with his tools: if a carpenter have broken or lost his chisel, he can use his plane-iron for the moment as an efficient substitute. I here rather wish to point out the abuse of calomel, and salivation by mercury, by those who consider mercury as a specific for fever. In the first place, it requires more time to affect the system by mercury than by tartar emetic and salines, &c.; so that some cases are saved by the prompt use of antimony, bleeding, &c., which would not have waited for mercury. I have seen the other useful means overlooked in the treatment of fever, by a too exclusive attention to mercury. And I may add that however valuable mercury is in all stages of peripneumonia, we know well that we cannot wait for its action in the acute stages without employing other active sedative treatment, especially bleeding and tartar emetic. Again, salivation puts the patient to very unnecessary inconvenience, independently of the weakness produced by its prolonging the convalescence.

Thus we witness the operation of two modes of diminishing the exertions of the heart, the necessity for which is universally acknowledged when the pulse is too *strong* and frequent; but it is not so generally acknowledged that when the pulse is frequent and *weak*, the heart is also over-exerting itself. It should be, however, remembered that in each case the blood is not only the load which is to be moved by, but the excitant of action to, the heart.

The diminution of organic action in the heart by sedatives diminishes its efforts equivalent to reducing the quantity of blood; and it is obvious to every one who has observed or felt the effect of a dose of salts, or of an emetic on the pulse, that this is the effect produced on the heart by salts, antimony, and other emetic and purgative substances, as well as by digitalis, prussic acid, and other sedative remedies. The operation of cold drink, or of cold externally, is also sedative; as is shewn by persons who, when exposed to inclement weather in travelling, can, though unaccustomed to stimulants, swallow brandy, which, under ordinary circumstances, would produce a sense of burning in the throat and intoxication. By the continued application of intense cold, as when persons have been lost in the snow, the sedative effect on the nervous system and heart produces total loss of sensibility* (miscalled sleep), and death by asphyxia.

Although emptying the primæ viæ by purgatives and emetics is useful in fever, it is not merely to the evacuating properties, but also to the sedative and constringent effects of those medicines that the benefit is attributable; and of this we have sufficient proofs. First, antimony controls fever, without either producing vomiting or purging, of which we are aware in the present day, when we use small repeated doses of tartar emetic, with or without salines, as a "febrifuge" medicine. Again, James's powder was formerly much used for the same purpose, and it was a common observation, that it appeared often most efficacious where it produced no evacuation of vomiting, or purging: perspiration cannot be called an evacuation, as it is only an evidence of returning function of the skin from decline of the fever. The saline medicines appear (besides their constringing effect on the capillaries) to have some influence in giving to the blood that arterial property (colour at least) which is so connected with nervous energy. Armstrong and Clutterbuck empirically confirm the benefit of sedatives in fever, without having accounted for their action.

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* When cold is applied to the head in fevers, &c., by means of pounded ice in a bladder, the medical attendant must himself from time to time watch its effects; of which the best nurses even in hospitals are not capable of judging. This applies especially to cases in which the patient is insensible. In all cases, except some maniacal affections, the cold should be removed, temporarily at least, when it ceases to afford sensation of relief, and becomes evidently disagreeable to the patient.

In surgical cases the symptomatic fevers often require antimonials to cool them; and though surgeons have employed emetics to promote the absorption (as they say) of abscesses when formed, they are not sufficiently in the habit of resorting to antimonials to prevent the mischief of their formation. The rigors, burning skin, and pain in the glands of the groin or axilla, from puncture or other injury of the toe or finger, may be cut short in the course of an hour or two, by an emetic, which removes the above symptoms, produces perspiration, and prevents abscess: the sedative influence should be maintained for twelve or eighteen hours by from a sixteenth to an eighth of a grain of tartar emetic (=xv. or xxx. drops of vin. ant. tart.) every two hours, or just sufficient, according to the stomach of the patient, to keep up the influence without causing the inconvenience of sickness.* Lind, when speaking of the destructive fevers of Senegal, describes the power of an emetic in arresting the fever; but complains that an emetic failed of producing so good an effect on the return (exacerbation) of the fever the following day. Had the influence been kept up as just described, with bark in addition, the fever would have been controlled.

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* A young surgical friend called me one evening to see his brother, saying that he had fever, and so much shivering and occasional bursts of perspiration, that he feared it would turn out to be small-pox. I saw at once, by the patient's eyes, that it was not idiopathic fever of any kind. On inquiring if he had not hurt his foot or hand, he said he had run a splinter into his middle finger the day before; but that he had been so wretchedly ill all day with headache and shivering, that he had never thought of that, so as to mention it to his brother. There were already red streaks up the back of the hand, slight swelling, and great tenderness, on pressure, in the axilla. I prescribed an eighth of a grain of tartar emetic every quarter of an hour until vomiting should come on, and afterwards every two hours until the tenderness should subside, or half the quantity, if it should produce more than very slight nausea. The second dose produced the full emetic effect, with instant relief of the headache and of the rigors, which never returned; and when I called the next morning, he had no pain in the axilla. The red streaks of the lymphatics on the wrist remained, which will suffice to remind any surgeon what might have been expected, if the inflammation had not been cut short. I have pursued the same practice in other similar cases, with equally rapid and decided relief. When pupils puncture their fingers they often apply caustic, which is very bad treatment of the wound. The best plan, if the finger be hot and painful, is to keep it in a basin of cold water, or cold poultices, and to take tartar emetic in the manner just mentioned, which will soon allay throbbing, inflammation, &c.

The successful practice of Broussais is a proof that the sedative effect of abstracting blood, watery diet, and withholding stimulants, can operate sufficiently in many instances, in spite of what others call his neglect of the bowels. At the same time that this is conceded, gastro-enteritis cannot be considered the *cause* of idiopathic fever; though it is true, as was shewn above, that in every instance, from the secondary loss of tone of the primæ viæ, and consequent unnatural state of their contents, more or less gastric morbid sensibility, congestion, or even inflammation of their mucous membrane, of the glandulæ agminatæ, &c. must be a constant *concomitant* of fever, as, in fact, dissection proves. Arguments drawn from successful practice are sometimes fallacious; the cure of fever by abstracting blood from the abdomen by leeches is no proof of gastro-enteritis being the proximate cause of fever, any more than that the seat of the disease is in the arm, if cured by taking blood from that part. I once met with a publication asserting that the seat of hooping-cough (pertussis) was the head, because leeching the temples relieved it: leeching any other part would have had the same effect; as, in fact, by some persons, blood is taken from the feet to relieve affections of the head, in preference to taking it from this part.

I have endeavoured to explain why in typhus we should avoid stimulants as much as possible, inasmuch as the nervous centres being in a diseased state of congestion or inflammation, neither they nor other organs have their power increased by them; whereas, by *indirect* (the sedative) practice, as it is called, we relieve the organs, and give them an opportunity of recovering themselves.

Leeching or venesection in typhus in the early stage is by no means more indirect practice, considering the symptoms, than in many cases of peripneumonia, or of synocha in the advanced stages. These three states of disease, side by side, present the same aspect, neither of them having the direct indications for bleeding, if, as such, strength of pulse and flushed hot skin be required to be present. A patient in typhus has the same proportion of blood in his system twenty-four or forty-eight hours after the attack, as if he had been seized by synocha or peripneumonia, in which no one would hesitate to bleed; and the prostration of strength in the three diseases is, in many instances, exactly similar. Every practitioner knows that patients in peripneumony have the dusky colour of skin, the weak rapid pulse, and lie supine like typhous patients; nay, more—when in this most dangerous state, they scarcely cough, from oppression and insensibility, and the cases may be easily mistaken by the inexperienced for idiopathic fever; yet who would think a patient too weak to be leeched or bled, however weak the pulse may be, when he is comatose from congested lungs, and in danger of suffocation? Where is the difference in the physical strength of the patient? or why may not an exactly similar set of symptoms be relieved in fever by similar means? Sometimes a patient in peripneumonia cannot at once be bled from the arm when much sunk, any more than in advanced typhus, lest fatal syncope should ensue; but by applying leeches, and drawing the blood gradually, the patient will be so far relieved that blood may subsequently be freely taken from the arm, to subdue that inflammation which had been but slightly relieved by the leeches; or without leeches, by skilful management, a little blood may at once be taken with a lancet. No man before Rasori had the determination to try "contra-stimulants" (bleeding, antimony, &c.) in typhus; and he cured his patients by these means.

But it must be remembered that the disease has a certain number of days to run, like small-pox; and therefore the patient must not be bled from day to day when symptoms continue severe: nature can only be lightened of a load to a certain extent, and so helped to totter through the weary journey with the assistance of medicines.[*]

[*] I may here give an example, which approaches closer than peripneumonia to what is called typhus. My clinical clerk told me one day that a patient had arrived much sunk in typhus; we went to the bed-side, and found that he had all that appearance: dusky skin with *petechiæ*, eyes dull, lying on the back, answers incoherent, the pusle small, soft—120; the skin dry, but rather below the natural temperature; the tongue dry and brown in the middle, with a margin of white fur. He *did not cough;* but on applying the ear to the chest, there was ronchus sonorus, gravis, sibilans, and crepitans—thanks to Laennec for enabling us to discover the last symp-

Patients may be bled with advantage in ague; but men have been inconsiderate enough to attempt to cure the ague by mere repetition of bleeding, the mischievous result of which may be easily imagined. In cases of simple typhus it is seldom necessary to bleed from the arm, but almost uniformly from the head, with leeches, using at the same time cold lotion, saline antimonials, and purgatives. But in typhus, complicated with inflammation of lungs or other viscera,

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tom. The man had been ill nearly a fortnight: and how often have we seen patients plied with wine in such circumstances, from the supposition that they were sinking from debility! I pronounced the case to be synocha petechialis, ".complicated" with the bronchitis of the epidemic (December 1831) in an aggravated state, with incipient peripneumonia. This was a case to shew students that the debility of febrile disorders is oppression from relative over-load of blood and the severity of disease—that depletion will lighten both, and that at the end of a fortnight it is not too late to adopt antiphlogistic practice. I recollect one student asking me if the man could bear bleeding? My answer was, "Do you think, if a scaffolding fell upon you, you could *bear* to have it lifted off?" We bled the patient immediately to sixteen ounces, gave him a purgative draught of salts and senna, and ordered it to be followed up by one drachm of sulphate of magnesia, and one-eighth of a grain of tartar emetic in solution, every fourth hour. The next morning he was nearly free from delirium, and sat up in bed: the bowels were still confined, and he had *some cough* (p. 144, l. 9.) The cathartic was repeated; but by mid-day, the medicine not having operated, he relapsed into stupor, the skin having become hot, and the *relieved* (p. 96 and 105) pulse 84, and full: he was immediately bled again, had another purgative draught and a purgative enema, and the saline antimonial continued. The next day, after the free operation of the medicines, he was relieved and the skin softer, but he *coughed more*. As he had been very delirious in the night, and the sensorium was still slightly affected, he had ten leeches to the temples; and from this time he quickly recovered.

In another of these petechial cases of fever, "complicated" with pleuro-peripneumony, which had been treated exactly in the same way—bled and leeched, &c. freely at the commencement—the patient (a girl æt. 15) became, on the fourteenth day of confinement to bed, much oppressed (sunk), feeble, lying supine, delirium increased, skin dusky, pulse weak and frequent, rhonchus crepitans. One of the students asked if I did not think she was sinking from debility, accelerated by the former loss of blood? My answer was, "Put your ear to her chest, and then bleed her;" and that there might be no mistake, I stood by until seventeen ounces flowed: from which time her pulse rose, and she gradually recovered. It is only clinical experience that can teach how apparent debility may be relieved by bleeding, or how late in a disease it may be resorted to with the most gratifying success.

I would now ask, had these cases been called (according to Cullen) synochus, and the latter stage considered to be typhus, and stimulants resorted to, as they would have been by those who employ them in typhus, and do not resort to auscultation, what would wine or brandy have done for these cases, which were cured by bleeding, purging, tartar emetic, &c.?

bleeding from the arm has been followed by as marked benefit as when the fever was not of the typhous character.

There are persons who urge strongly that bleeding should never be resorted to in any disease. I feel certain, however, that there are cases in which it would be unjustifiable to lose a moment; such as inflammation of the head or chest, whether idiopathic or from metastasis, in which bleeding produces immediate relief; and even the short time necessary for the sedative influence of medicine to be induced, might give time for irremediable mischief to take place. It is necessary to know that the quickest substitute for venesection is an emetic of ipecacuan. or antim. tartar.; and it should never be forgotten, that a table-spoonful of mustard (which may be found in every house), mixed with a little water, is a quick and efficient emetic, though not so sedative as antimony, &c.; but it does to begin with, to be followed by saline antimonials and other sedatives. And a practitioner who is skilful and decided in the use of sedatives can dispense with venesection much oftener than is the common custom.

In the commencement of fever, the saline draught, with from 1-8th to 1-12th of a grain of tartar emetic and ʒss Epsom salts should be given every half hour, until nausea or vomiting be produced, and then every three or four hours in diminished doses, so as to keep up the sedative influence.

After all this, it may be asked, how it happens that stimulants sometimes save the life of patients in typhus? In the states hitherto considered, the heart was not deficient in perception of the presence of the blood—it exerted what strength it had; but from the violence or long continuance of the fever it will sometimes flag, before the nervous system, upon which the vital powers depend, has made any progress towards amendment; the patient will, in fact, begin to die, the pulse fluttering, with cold clamminess on the skin. It is now that artificial stimulus will sometimes renew enough of action to gain time for the nervous system to recover, if not already too far exhausted, or the respiratory function too far gone to arterialise the blood, in which case life cannot be sustained; as may have been seen when the pulse has actually been kept up unavailingly by stimulants for many hours before death. The exact period at which stimulants may be administered with benefit is one of the utmost consequence in practice, involves great responsibility, and can only be ascertained by experience at the bed-side, and varies peculiarly in the epidemics of different seasons, according to what Sydenham denominates the "constitution of the epidemic in the year.

Those who stimulate too early, by making the heart over-exert itself, and by expending the nervous influence, actually bring it and the nervous system sooner to that state described, in which a continuation of stimulus will be necessary to carry the patient through; for upon every remission of the stimulus, they find the patient drooping; and therefore, from observing this phenomenon, they become persuaded that they have been pursuing the right plan from the beginning. I have shewn that sometimes there is a necessity for stimulants at the last, when the fever is gone (p. 133), which has been called the crisis ("the diathesis of disease being changed"), and yet not enough of natural strength left to carry on life. But how is it to be known when fever is gone? By referring to its *essence*, the *loss of function of the nervous system.* The fever is gone when the nervous system begins to regenerate nervous influence; when the intellect becomes clear, and volition free, however weak—for *subsultus may still remain*, and other marks of *great debility*, and there *may be debility of brain*, amounting to childishness, *but delirium is gone*, and *the eye follows objects*[*] besides the evidence of renewed secretion in the mouth, nose, skin, &c. &c. Patients themselves can often refer to the exact time of the fever passing off, by the mere return of consciousness, although they may not have had power of moving or speaking;[†] but even then we may have some difficulty in conducting them to perfect health, by food, tonics, narcotics, stimulants, and occasionally perhaps a recurrence to sedative evacuations, according to the changes whcih take place. The *collapse* produces a state of inanition favourable for the action of stimulus: nevertheless, if capillary action, *contraction*, do not recommence in the cineritious substance of the nervous system, death must take place in spite of stimulus.

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[*] This is the great distinction, *the eye*; for even in this stage there may still be delirium: but after the crisis or change of diathesis, it is no longer the dull-eyed typhoid delirium, but the delirium (tremens) of inanition; and it is at this point that the experienced practitioner uses stimulants and opium with masterly effect. Even in the commencement of inflammatory and febrile attacks, the man of experience will be on his guard against a state of delirium tremens, and will ascertain the habits of the patient, who may have been accustomed to live freely and luxuriously, though much within the bounds of what could be called intemperance; and, again, delicate persons of nervous temperament, especially females, who live abstemiously, easily fall into the delirium of inanition.

[†] A friend of mine, commander of a ship, on the crisis of fever, becoming suddenly conscious, though still apparently dying, and unable to move or speak, heard his men talking over the mode of sewing his body in his hammock, to consign him to a watery grave with the greatest propriety and respect. A lady told me that, after

Those who, on the contrary, relieve the system early by sedative (antiphlogistic) treatment, will diminish the *duration of the violence* of the fever; but as in every fever a poison is introduced into the nervous system, from the effects of which, in every case, a certain time is required for its recovery, the young practitioner must not be induced to think that, by any measures, fever can be "*cut short*" all at once, or that it can be more than *checked*. There are some cases recorded which apparently support the opinion that free bleeding, &c. can stop idiopathic fever at once; but I am more inclined to think those have been symptomatic fevers depending on some intensely acute internal inflammation; or if idiopathic, of that rapid course which sometimes takes place during epidemics—sometimes malignant, but not always so. Or it is possible that idiopathic fevers have been in some instances so completely checked as to have appeared cured; as patients in chicken-pox or mild small-pox feel well and able to exert themselves after the fourth or fifth day, though the disease is not gone for many days afterwards. As a general rule, idiopathic fevers, as far as I can judge by experience, run a definite course, though we have not such accurate information with respect to the duration of synocha and typhus as we have concerning small-pox, measles, and other febrile diseases produced evidently by infection, which also may be subdued, though not stopped, and of whose existence the spots are evidence, even when completely subdued; as cases of mild small-pox frequently occur, as above alluded to, in

having been "given over in a twenty-one-day fever," she became suddenly conscious in the middle of the night, but unable to move or speak. Her maid and a hired nurse were discussing the hopeless state of the patient over a jug of porter. She managed somehow to make them understand her desire to have some of it; upon which they consulted together, and coming to the decision that it could not make her worse than she was, gave her nearly a tumblerful. She immediately fell asleep; and, awakening in the middle of the next day refreshed and strengthened, startled her servant by speaking to her in a distinct voice.

which, if it were not for the danger of infecting others, the patient could attend to his business long before the crusts have fallen off; still, in those cases we know that there remains a spark, a smouldering fire, which is capable, during a short period, of being relighted. In many cases of *fever* also, the *symptoms relax* a week or a fortnight earlier than in others; and, on the other hand, severe typhus or synocha, like small-pox may be protracted much beyond the ordinary duration, even when not eventually fatal. Thus, the ordinary duration of fever is about fourteen days; but when it is protracted to three weeks, the popular term applied to it is "a twenty-one-day fever," implying that it has been unusually severe.

It may appear as if, having said so much against the misuse of stimulants, I were inclined to deny their utility in fever; but, on the contrary, I have shewn one state in which they become indispensable; and that they are often of great benefit the moment the fever has ceased, when the influence of the poison has passed off, which has been called the CRISIS: there is then often so much real debility, that the patient's recovery (convalescence) would be very tedious, or perhaps the powers of digestion, &c. not equal to restoration, unless assisted by stimulus; and when fever is gone, to promote appetite and digestion, wine may be of the most marked benefit, if not indispensable (pp. 147 and 148, *note*).

I have often been asked for a rule as to the administration of wine in fever, by persons who have remarked that they have seen others administer it with great success, but could not themselves feel certain in the indication. Besides what I have stated above, I would say, that the person who best understands the nature of delirium tremens will be the quickest to discern the propriety and necessity for the administration of wine and opiates in fever, erysipelas, &c. Even in inflammation of the viscera occurring in debilitated debauched constitutions, it is absolutely necessary to give more or less of stimulants at a very early stage.

I may here observe, that narcotics are frequently useful *during* fever—nay, necessary—as may be understood by referring to the *essence* of fever, and knowing that sleep is nature's restorer of the deficient nervous influence. The obstinate wakefulness which takes place in some cases of fever must have a deleterious tendency to produce collapse; hence the benefit of gentle opiates:* and in support of this opinion and practice, I may quote two good recent authorities, Dr. R. Williams, in his useful and interesting work, the Elements of Medicine, and Dr. P. M. Latham; the opinions of both having the value of being formed on extensive clinical experience.

The eruptive fevers (exanthemata) are to be treated precisely on the principles already laid down. I cannot too seriously caution the young practitioner against implicit reliance on the nosologists, as the exceptions to their rules are endless. For instance, scarlatina is put down amongst the exanthemata as occurring once only in life. I have known it occur three times in the same individual—frequently twice; in one instance, in its exquisitely marked form, as to inflamed tonsils, appearance of tongue, eruption, and desquamation of skin, twice within ten months. Again, the duration of the stages may vary; thus, it is said that the eruption appears on the third or fourth day. I have seen a child in good spirits, and perfectly well in every respect (having examined it on account of the other children in the family being affected with scarlatina,) one evening, and before the next as red as a boiled lobster from the rash of scarlatina, with sore throat and swelled tonsils. An eighth of a grain of antim. tartariz. produced vomiting, with relief of the difficulty of deglutition, and stopped the swelling of the tonsils, within an hour. At this time the tongue was represented in the plate to Bateman's edition of Willan, with a white fur, and scarlet papulæ staring through it. The following evening a state of collapse came on, delirium, the pulse rapid and weak, the breathing laborious, lips purplish, skin cool, and rash faded. It is in similarly rapid cases that death takes place on the third or fourth day. I administered another dose of the tartar emetic, which produced vomiting in a quarter of an hour. Within two hours the breathing was relieved, the pulse fuller, though still 130, and the skin returned to its redness and full heat of regular scarlatina. The lips also lost their lividity, shewing the relief of internal congestion by the antimony; yet, in similar cases, how often have I seen wine, and even brandy, given to children of the same age (five years), who did not recover. On the third evening, less than seventy hours from the commencement, the child asked for animal food; from which I felt certain that the crust must be coming off the tongue; and on inspecting it, found, in fact, that it was loosening at the edges; and it began to come off in flakes during the night, and from the tonsils, which had never swelled any more after the first emetic. Thus the disease, which we usually see occupy seven or eight days, went through its phases within seventy hours.* The child was well, and walking about the house, on the fifth day, the skin having desquamated. This patient, being a relative, and living near me, was visited, whilst dangerously ill, six times at least every twenty-four hours. I then prescribed sulphate of quinine and sulphate of magnesia in water acidulated with sulphuric acid, about every six hours, and lemonade in abundance as drink; the child had one dose of pil. hydrarg., and pil. aloes cum myrrhâ, the first day. The immediate relief of symptoms may be fairly attributed to the treatment, though not the rapid progress (evinced by the early desquamation) of the disease; for, on the contrary, it shewed a rapidity of malignity in itself, as we too often see in fatal cases. Quinine has not much influence on any continued fever; but it unquestionably makes the convalescence more rapid in all cases. I esteem the sulphuric acid, and the lemonade drink, or lemonade made with lemonpeel and the mineral acid, of the greatest use as a lotion to the fauces and primæ viæ,† which are in an inflamed or congested state: in the case above related, they assisted in preventing the croupy state which sometimes destroys life in scarlatina, a copious coriaceous lymph in the fauces having existed when the laborious breathing came on.

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* From the congested state of the nervous centres in fever, syrup of poppies, or a few drops of laudanum, will produce an effect equal to that of a larger dose of opiate medicine in other states of disease.

I may observe, that small-pox differs from the other eruptive fevers in one respect as to its nature, which does not alter the indications of cure, but only increases its difficulty. Small-pox is dangerous in proportion to the quantity of eruption; whereas the others are rather the reverse. (I do not include chicken-pox, in which there is no danger.) Independently of the fever, small-pox destroys life, when there is a great amount of confluent eruption, by the depression of the system produced through the destruction of a large surface of the skin, such as takes place from extensive burns or scalds, which are confessedly very fatal. The large number of terminal branches of nerves destroyed in these cases fully accounts for the degree in which the constitution suffers.

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* This is not a solitary instance. I have seen the same occur several times.

† The sulphuric, nitro-muriatic, and other acids have been recommended by many experienced practitioners in fevers as well as for gargles, and I may observe, that their utility, when applied to the mucous membrane within view, as in the fauces, will explain the efficacy of the vegetable or mineral lemonades in relieving the tenesmus, griping, nausea, &c. of bilious diarrhœa, more quickly in the first instance than opiates alone; as they not merely constringe and relieve the congested or inflamed capillaries of the mucous membrane, but help to wash away the acrid bile.

It will be useful to point out in this place the distinction between disease in an organ arising secondarily during fever, and primary disease of the same organ exciting fever. Our subject will be equally illustrated, whether we select an organ in the chest or abdomen. Let us take a case of idiopathic continued fever, in which, from the disturbance in the secreting organs, gastric morbid sensibility comes on early; the mucous membrane of the intestines being irritated by their unnatural contents, there is uneasiness of the abdomen on pressure, and great heat and dryness of the epigastrium, without either diarrhœa or any obstinate constipation; and along with this, languor, prostration of strength, more or less confusion of ideas, or delirium, evincing lesion of the nervous system, the essential marks of fever.

On the other hand, let us take a case in which, from any cause, there is a deficiency of good bile in the intestines; the food, instead of being digested in the natural way formerly described, becomes putrid, acid, or otherwise acrimonious, not affording nourishment, and at the same time irritating and producing morbid sensibility. We shall here have the same gastric symptoms; but instead of fever, there will be only *feverishness* (*pyrexia*), from the disturbance (morbid sensibility) communicated to the nervous system, inducing heat of skin, quick pulse, &c. (pp. 101, 106, 110); headache perhaps, but not delirium; and little languor, until actual debility from inanition ensues.

Now, as to treatment, if tartar emetic be given in the dose of about one-eighth or one-fourth of a grain in water every hour, the effect upon the case, depending upon mere gastric morbid sensibility, will be to produce sickness, by which the patient will be relieved, and immediately cooled, particularly if the bowels be opened by it at the same time; and a repetition of the tartar emetic will produce sickness each time.

But the effect of tartar emetic on the case of fever will be less marked; for though it may produce nausea at first, with some diminution of febrile symptoms, yet the relief is not so decided; and if the medicine be repeated, it does not produce nausea, but only diminishes the febrile symptoms, and requires to be persevered in to continue the control over the fever, or may even require increased doses, and to be assisted by bleeding. This latter case exemplifies what in the new Italian doctrine is meant by a strong diathesis, in which there is great tolerance of contra-stimulant medicines.

Now, either case of disease may prove fatal: the idiopathic fever by the gradual failure of the functions of the lungs, heart, and brain; the sympathetic fever from gastric disease, by rapid marasmus; for though the sedative tartar emetic cools the patient, and subdues the symptomatic fever for the moment, if digestion cannot be restored, the patient will rapidly sink under renewed symptomatic fever and inanition; and the same result takes place whether the disease be gastro-enteritis (that is, inflammation), or gastro-enteric morbid sensibility, caused by the irritation of undigested aliment from want of secretion of good bile. The latter case is an illustration of what takes place in infantile fever (the infantile remittent), or gastric fever of children. It is often cured in the commencement by a dose of calomel, either alone or with castor oil or other purgatives, evacuating the primæ viæ; whilst at the same time the mercurial renews the secretion of bile, so as to restore digestion, and all goes on well, either permanently, or only requiring a repetition of the same remedies. But often the case is more obstinate, and a torpid, congested, or perhaps we should say sub-acutely inflamed state of the liver, requires not merely repeated doses of calomel or other mercurials, but leeches and poultices, or cold* wet cloths, to the epigastrium. One of the embarrassing symptoms in these cases is a purging of a dirty, watery fluid;† but this must not dissuade the inexperienced from persevering with calomel; for as soon as it makes the motions* yellow or green, this state will cease; or if chronic diarrhœa then continue, as it sometimes does, from a chronic inflammation or congestion of the mucous membrane having been induced, astringents, such as catechu or hæmatoxylum,† will cure it. These cases, though called infantile

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* The application of cold is, I think, not sufficiently often used in inflammation of the viscera of the chest and abdomen when the surface becomes decidedly hot.

† This in hot climates runs on to dysentery, and I have had cases of old dysentery from India which had been attempted to be cured by various astringent and other medicines, which yielded to blue pill or hydrargyrum cum creta.

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* The appearances of the feculent excretions, though constantly examined, are not, I believe, sufficiently understood. The first thing with which the student should become acquainted, with respect to the appearances of the intestinal excretions, is the variation of the natural colour, which resembles that of gamboge: this substance, when moistened, is of a pale bright yellow, and, when dried, gradually becomes darker until quite dark brown. Such are likewise the shades of tint of the fæces in health; becoming paler in proportion to the scantiness of good bile, until, when that is wanting altogether, they assume a light grey appearance. When, for example, the liver is inflamed, gorged, and swollen, it excretes a quantity of nearly black bile, causing diarrhœa, as is frequently seen in the hepatic complications of fever in hot climates: calomel, sulphate of copper, and liquor arsenicalis, are remedies for this black bile. In the chronic hepatitis of persons of intemperate habits, there is often an abundant secretion of a reddish bile. There are some substances, more especially calomel, which produce a chemical change in its colour, and consequently in the colour of the motion, rendering it grass-green; and persons who are ignorant of this fact often continue to give more mercurial and other medicines, though the green colour of the fæces is a proof that sufficient secretion from the liver is going on, the colour being that of good bile acted upon by the medicine, shewing, therefore, that more is unnecessary. Independent of colour, slimy, mucous, or gelatinous matter in the fæces is an evidence of merely over purging from diarrhœa, dysentery, cathartic or other medicines, &c., and generally indicates the propriety of astringents and mucilaginous diluents.

The alterations of the secretion of the kidneys have been already alluded to, and the peculiarities in each disease are generally understood. Young practitioners and patients are frequently unnecessarily anxious about the common appearance of sediment, sometimes with a reddish tinge, which takes place as the natural process of the decomposition of the urine after standing a few hours, and which varies very much within the limits of healthy secretion, according to changes of diet, wine, &c.

† Medicines and dietetic directions sometimes fail merely from being too energetic. Thus, a child aged eight was very pale and wasting, with no evidence of disease except total loss of appetite, which had ensued after mild scarlatina. She had slight swelling of the submaxillary gland, but could not be called strumous. A medical friend, who saw her, prescribed animal food and fermented liquor, compound infusion of gentian with a little quinine, and gentle laxative doses of calomel and rhubarb, as the bowels did not act. Finding in a week that she was no better, and annoyed with flatulence and acidity in addition, he consulted me.

The prescription was excellent, could it have been borne; but as excessive debility of the mucous membrane and glands of the primæ viæ existed, a milder medicine and diet were indicated. I prescribed half an ounce of decoction of hematoxylum, with an equal quantity of chalk mixture, to counteract the acidity and flaturemittent, unlike the genuine aguish remittents, are little relieved by bark.

Notwithstanding that we have made out clearly enough that there is a synocha and a typhous fever—*i. e.* fevers which begin, continue, and terminate with the characters given. of those diseases; and that in those cases called typhus there is the strongly marked difference of sensorial oppression—the question arises, whether these states are really specific, or only accidental differences; and whether there be really a specific typhus or not?—in other words, whether there be any simple continued fever but the one which, arising from the same infection, or other exciting cause, may assume the garb or type of synocha or of typhus. The circumstance of Cullen having made a synochous fever, shewed that he could not establish a diagnosis, and therefore produced a hybrid. The synocha petechialis, for instance, is constantly called typhus when seen for the first time in the sunken state above described; or it is named synochus by those who have observed that the fever was not typhous at the commencement, but did not at the same time notice the petechial eruption. In the assertion that its nature has been frequently undetected, I am borne out by the opinion of that accurate and talented physician Dr. R. Bright.

We have some analogies in the well-defined exanthemata, which would make us doubt the existence of a *specific* typhus; for in-

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lence, and half a drachm of Epsom salts, to keep up the peristaltic action, three times in the twenty-four hours; and a diet of animal food made into a soup, instead of giving it in substance, with milk and bread. In ten days this plan induced appetite and digestion, and enabled her to resume the medicine and diet as first prescribed, which soon perfected her cure.

The logwood, from its slightly sensible qualities, is much undervalued as a mild tonic, and is too much looked upon as a mere astringent, though it contains little tannin. It is so commonly considered as a mere astringent (on account of its great efficacy in checking diarrhœa and dysentery), that the prescribing it with a saline laxative would be thought contradictory by those who do not consider that it was given in the above case as a mild and efficacious tonic. Some think it contradictory to give an astringent with an aperient, because astringents have been usually exhibited along with stimulants and stimulant narcotics—in diarrhœa, for instance; but enough has been already said to shew the benefit of astringents with salines where the diarrhœa is combined with an inflammatory congested state of the mucous membrane and a febrile state at the same time; and that simple narcotics and astringents in themselves are not "heating," any more than tonics, though the patient will become heated if the requisite collateral treatment be neglected (p. 79 *et seq.*)

stance the eruptive fevers in their ordinary routine correspond with the synocha of Cullen, with strong pulse, &c.; but it is well known, that where scarlatina attacks several members of a family, some of them will have a typhous fever from the beginning, with scarcely any rash. Measles may present the same phenomena. The spots of synocha petechialis frequently do not appear till about the ninth day. Should the disease have taken a typhous turn before that time, the spots may have never been seen, or if discovered, were faint, so as not to be distinguished from the typhous petechiæ (which are little ecchymoses, not rash,) with which they were mixed. When called in to cases of this disease, I have frequently asked whether the patient had any eruption, and been answered decidedly in the negative; but upon examining the chest, especially towards the axilla, have pointed out numerous spots of the rash, which had not been observed by the attendants, not having been sought for; but in a typhoid state the eruption is generally a matter of investigation. It has been remarked by experienced practitioners, that when typhus has been prevalent, some cases (which they nevertheless still called typhus) have occurred in which the sensorium was not much oppressed—some with a strong pulse at the commencement, some with hot skin, &c. &c.; in fact, that "no one symptom could be found uniformly present." This goes to confirm my opinion, that *there is but one simple fever, and which is exanthematous, petechial, though the rash may never be sensibly developed, as in scarlatina maligna; that it is continued, synochous* ("synocha," δυνέχω), *whether with high or low pulse, high or low temperature; and that, when the sensorium is oppressed in addition* (p. 130, note), *it is typhous* (typhus).

Having taken a view of the train of symptoms denominated FEVERS, symptomatic and idiopathic—which we have traced to a loss of the functions of the nervous centres, and subsequently of the organs depending on them,—we next have to consider other diseased states, denominated NEUROSES, which, like fevers, consist primarily of derangement of the nervous system, though differing from them in the subsequent phenomena; and the leading characteristics of which are pain, and a tendency to spasmodic, convulsive, involuntary motion. It is necessary to keep distinct views of these different states of disease (febres and neuroses), though they sometimes run into each other; pyrexia (feverishness) participating somewhat in the characters of each.

In explaining these disorders of the nervous system, neuroses, we must still refer to the principle of disease being only the *alteration* of healthy *actions*. Hence a sound physiology is absolutely necessary as a substratum to the practice of medicine; for, however much has been gained in pathology in general by mere experience, the practitioner will observe, as he advances in acquaintance with the neuroses, how completely we are dependent upon a knowledge of the manner in which the functions of the nervous system are carried on in health, for any correct principles which must guide us in their treatment.

When the sensibility of a part morbidly increased becomes pain, and this takes place without perceptible accompanying inflammation, pathologists name it a state of NEURALGIA, implying merely *pain of nerve*, in contradistinction to *pain from inflammation*, in which there is always palpable evidence of the *vessels* being implicated. Neuralgia has been known by the term "irritation," or "irritable state of a part," as the "irritable spinal cord," "irritable mamma, uterus," &c. This morbid sensibility is in the nerves, existing often without that participation of the vascular tissues which constitutes inflammation, though sometimes inflammation is induced by it.

Now, when this state, which I call morbid sensibility, of sensitive nerves exists, it is indicated by pain. But it may exist in the organic (and incident ?) nerves without pain; and thus the disordered state be set up in the nervous centres, producing evident symptoms, by spreading thither from a part in pain, or from a part not in pain, according to whichever class of nerves is injured.

The import of the term morbid sensibility must not be misunderstood, because I apply it to a central organ, of which the patient's sensorium is not conscious: he does not then feel the morbid sensibility; but the central organ, the spinal cord, does feel, as it were —it is over-susceptible to impressions on its nerves: therefore the state is morbid susceptibility, excitability, or sensibility of the spinal marrow, independent of *animal* sensation (p. 106.)

An inquiry into the nature of the proximate cause of morbid sensibility ("irritation"), or the actual state of the minute filaments composing the nerves and central masses of medullary matter when they evince the phenomena of morbid sensibility, offers an extensive field for research. Is it inflammation? It has occurred to me that it will hereafter be proved, perhaps by means of the microscope, that it is inflammation of them, neuritis (p. 55), either in the tract of the nerves, or at their union with the nervous centres. It is necessary to observe, however, that as in external parts, so also in the nervous centres, morbid sensibility, with or without pain, exists with a state short of inflammation, viz. with that state of inanition or contraction of capillaries which we sometimes see to precede inflammation, but which is not always followed by inflammation (pp. 72. 120, and 125), as in case of hæmorrhage, sudden fright, excessive cold, or an excessive quantity of digitalis; the whole of which produce the convulsions of morbid sensibility, and all evidently induce the contracted state of capillaries, the opposite of inflammation. Some of the symptoms of general morbid sensibility result from the inflammation which ensues upon excessive contraction: the two opposite states of contraction and dilatation of capillaries, therefore, are accompanied by the same phenomenon, morbid sensibility ("irritation"). An exemplification is the morbid sensibility which accompanies symptomatic ("irritative") fever. In order, therefore, to cure, we ought to know whether the indication be to employ stimulants to dilate the capillaries, or sedatives and tonics to constringe them.

The consequence of the brain or spinal cord becoming in a state of morbid sensibility is, that its healthy actions are deranged; that is to say, in health the brain communicates to the muscles of voluntary motion the dictates of the will only; but if the origin of the voluntary nerves of a part, in the brain, be in a state of morbid sensibility, or if the same disordered condition of the part of the medulla spinalis through which the nerves pass exists, that part may be thrown into action independent of the will, or even against its dictates. This is the explanation of those involuntary motions, convulsive or spasmodic, arising from a spicula of bone within the skull, or a tumour pressing on the brain, which produces convulsions called epileptic; or a depressed fracture of the skull, which also causes convulsions. Similar local injuries of the spinal cord are followed by the like results. The same effect is even produced when nerves, being injured at a distance from the nervous centre, the injury, whatever it may be, whether physical (neuritis ?), or an alteration of the dynamic or electroid property of the nerve, spreads, whether of sentient or of organic (or incident ?) filaments; so that the injury of the nervous centre at the origin of the nerves of motion makes it re-act, and throw the muscles of voluntary motion into involuntary action, which is the *rationale* of locked jaw, tetanus, hysteria, some kinds of epilepsy, &c.* It is well known to those who have seen much surgical practice, that epileptic convulsions, as well as tetanus, will come on occasionally from morbid sensibility in the nerves of a fractured or wounded limb.

Mental excitement, such as anger, grief, fear, &c., which are analogous to the direct *irritation* of the brain or spinal cord by a depressed fracture or spicula of bone, will produce the state of *morbid sensibility* of the nervous centres indicated by involuntary, or almost involuntary, muscular actions—even by epileptic fits. Laughing and sobbing (convulsions) are produced by the cerebral excitement of good acting, and of various kinds of eloquence. Again, we know that a person may be tickled into fits; that certain pleasurable sensations in excess may produce epilepsy; which is analogous to the accidental injury of nerves at a distance from the central organ. The instances of morbid muscular actions produced through impressions on the *brain* shew that, notwithstanding the independence of the spinal cord as to some of the functions or properties of the nervous system, a most intimate connexion exists between them, although the mode of connexion has not been hitherto satisfactorily explained.

Impressions upon the nervous system, distinct from the brain—for instance, any continued irritation of an organ, as of worms in the intestinal canal, though scarcely or not at all perceived by the individual, or disease of the nervous centres even in the fœtal state

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* The morbid sensibility from long-continued voluntary action of the sphincters induces reaction in the form of the convulsive motions called rigors, or shivering. Every nurse knows, when she feels an infant shiver, that it is about to make water; and the shudder produced by the sphincter vaginæ is well known, as also the shivering produced by the painfully continued action of the sphincter ani caused by piles, or by the necessity of retaining the fæces against the natural inclination. These instances of shivering are convulsions independent of temperature. We see an almost involuntary reaction when a person under the influence of pain clenches the hands or grinds the teeth.

—will produce partial or general convulsions, or a permanent spasm of certain muscles, as of the gastrocnemii, &c., giving rise to the production of club-foot, as shewn by Dr. Little in his treatise on the cure of that disease by division of the tendo Achillis or other tendons.*

Or a higher degree of injury at the root of the nerve may produce paralysis, which, by destroying the equilibrium of the different classes of muscles, is another cause of club-foot and other contractions of limbs. The well-known fact of diarrhœa producing cramps in the calves of the legs, is an additional illustration of this subject. These partial and general convulsions, or spasms, arising from irritations at a distance from the nervous centre, are instances of morbid reaction (deranged "reflex" actions) of the spinal marrow; and the tenderness (morbid sensibility) of the abdomen in hysteria, without inflammation, is an example of the morbid sensibility of the spinal cord (induced by neuritis?) propagated from the uterus (p. 108, *et seq.*). To compare small with great things, there is an analogy between globus hystericus and hydrophobia; and the discovery of a cure for the latter, in some medicine which has a rapid effect in allaying that state of the nervous system common to the neuroses, should not be despaired of. In fine, we see that convulsions, —involuntary actions or spasm of the voluntary muscles, as well as spasm of the involuntary muscles,—are produced by whatever excessively excites (produces morbid sensibilty of) the nervous centres, either locally or from a distance.

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* There have been at all periods attempts made to cure contractions of the joints by mechanical apparatus alone, without cutting the tendons of the contracted muscles; and the success in some has made instrument-makers and others, who do not understand physiology and pathology, think that all cases are curable by this means. Dr. Stromeyer and Dr. Little, both in their publications and practice, prove that many cases are curable by apparatus, without dividing tendons. Dr. Little has further shewn, that there are certain cases in which even instruments are not required; but that, being spasmodic affections, they are curable by medicine alone, combined sometimes with a little manipulation. He has also clearly pointed out the cases in which the tendons *must* be divided: thereby setting aside the absurd assertions which have been made, through want of sufficient experience in the actual treatment of these diseases, or through not having sufficiently considered the subject. Granting that there is a certain class of cases which might, with great care and attention, be cured by instruments in the course of months or years: by adding in many of these the operation, which is scarcely painful, and not in the least dangerous, they may be remedied in as many weeks—sometimes, it might almost be said, in as many days; for as the minute wound invariably heals by the first intention, the patient sometimes begins to put the foot to the ground in a day or two; so that, independent of there being cases not curable by instruments alone, many curable by them are remedied by the Stromeyerian plan without any comparison of time, expense, or pain, or, according to the old adage, *tuto, cito, et jucunde.*

In neuralgia there is no perceptible alteration of structure, as in painful chronic affections of the face, heart, stomach, uterus, mamma, colon, &c.; whereas many serious and destructive inflammations, combined with pyrexia, give but little pain. The degree of constitutional or general morbid sensibility is also not proportioned to the local pain or inflammation, but often much greater; nor has it been hitherto explained why one gun-shot wound of a limb should produce fever, and an apparently exactly similar one locked jaw. The difference in the nature of constitutional or general morbid sensibility, however, I am inclined to believe, depends upon whether the cineritious or the medullary part be principally affected: fever consisting of congestion of the former—tetanus, of disturbed action in the latter—the state of morbid sensibility (neuritis ?). Fever and general morbid sensibility must be well distinguished; for though fever be accompanied by morbid sensibility, as nausea, headache, rigors, &c.; and continued severe constitutional morbid sensibility may be accompanied by febrile excitement of skin and pulse, we must be cautious in depleting in the neuroses, as depletion increases the sensibility of the nervous system; and this, in some of the neuroses, is a difficult point to discriminate in practice, when an organ of importance appears to be implicated, as when hysteria *simulates* peritonitis, pericarditis, pleuritis, or phrenitis. We must not, however, underrate the consequence of morbid sensibility, though it be not fever, for it sometimes proves fatal, as in tetanus, hydrophobia, &c. We may consider gout of the stomach to be a mixed case, and it is relieved by treatment different from what we should resort to in inflammation of that organ with fever, in which we should employ depletion and antiphlogistic means; for in gout in the stomach* we must immediately resort to laudanum,† and sometimes, if the pulse flags, to brandy, for the relief of the morbid sensibility. Again; another instance of morbid sensibility—without fever, though sometimes with considerable pyrexial flush of surface—occurs occasionally after parturition, where, in many cases, an inexperienced person would suppose, from the tenderness on pressure of the abdomen, that there was puerperal peritonitis and a necessity for bleeding; whereas all that is requisite is an opiate and repose. Bleeding or purging would be highly injurious (p. 125), the tenderness being only morbid sensibility of the part, arising from the origin of its nerves being rendered morbidly sensible by those of the uterus.

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* Gout commences with neuralgia, inflammation follows: the painful morbid sensibility may stop the action of the heart, through the nerves of the solar plexus, and cause death before there is time for inflammation,—like a blow on the pit of the stomach, or the swallowing an inordinate quantity of ardent spirits.

† Laudanum will be enough, if the heart has not begun to flag. A young practi-

In many instances where there is inflammation, if there be *also* much morbid sensibility, evinced by pain, the latter is a most urgent and dangerous symptom; as in cases of poisoning by oxalic acid, cantharides, and other acrid substances (p. 65, *note*), in which, besides getting rid as much as possible of the poison, large doses of opiates are necessary. Remedies which are of use in inflammation with fever are of little avail, if not injurious, in the immediate treatment of cases wherein morbid sensibility is the predominant symptom, as in the case just alluded to, or in gout in the stomach.

There is great difference between fevers and neuroses, both in proximate cause and treatment. In fever there is, in my opinion, lesion of the cineritious part of the nervous system chiefly, rendering it insusceptible of being beneficially affected by ordinary stimuli, as above explained, the delirium or coma of fever being that of plethora or oppression. In the neuroses the nervous system is subjected to some noxious local influence or impression, which produces altered sensibility or spasms of various recurrence and duration; as seen in a healthy animal convulsed from loss of blood; convulsions in a healthy child from teething, worms, &c.; tetanus produced by cold; hysteria, chorea, &c.

Most or all of these forms of neuroses—variously modified indications of the state which, in opposition to fever, I call morbid sen-

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tioner nearly lost a gouty patient by treating him as for gastro-enteritic inflammation with leeches, &c.; when a clinical clerk of mine, who was a relative of the patient, happening to call in, recognised gout in the stomach, and speedily removed it by a large dose of laudanum.

sibility ("irritation")—appear to depend more particularly upon diseased action of the medullary parts of the central organs, however produced, whether arising there primarily, or induced there by disturbance in the periphery of the organs. The delirium or coma of inanition—delirium tremens, delirium from loss of blood—depends upon a state of the cineritious tissue the reverse of fever, anæmia rather than plethora. But although, upon a careful analysis of the symptoms and the different forms of the neuroses, we may, with attention to physiology, refer some to an affection of the cineritious (in which I include the cineritious parts of the cerebrum and cerebellum, the grey matter of the spinal cord, and of the sympathetic system), others of the medullary parts of the nervous system, we should, *à priori*, from our knowledge of the connexion and mutual co-operation of these two divisions of the nervous system, expect to meet with disease depending upon simultaneous disturbance in both. Thus, from the violent operation of sedatives, or when an animal is bled to death, the first to suffer is the most vascular, the secreting and the sensorial part, the cineritious substance; hence the indistinctness of the perceptions and thoughts, and the weakness of the involuntary and voluntary actions. If the operation of the sedative be increased, or the analogous injury of further loss of blood take place, the medullary part of the nervous system evinces its effect by general spasmodic muscular contractions. The state of the medullary matter during this time is represented by the symptoms which I designate morbid sensibility, which may exist in all grades constituting the various forms of neuroses—from a slight neuralgic pain, to the most distressing clavus hystericus, tic douloureux, or agonising pain in the back of the head and loins, as in hysteria or from hæmorrhage; from the spasm of one or more muscles, the gastrocnemius or those of the jaw, to the universal spasm and universally increased sensibility of tetanus and hydrophobia. Epileptic convulsions from terror must be a compound affection—the disturbance of the medullary part depending upon the previous affection of the sensorial.* The actual condition of the capillaries of the medullary tissue,—the proximate cause of the symptoms of morbid sensibility, *i. e.* whether the phenomena of the latter depend solely upon an alteration of the dynamic state of the nervous tissue, independently of any physical change in the capillaries, such as *neuritis*, for example, is a more difficult subject to determine. Whatever it be, it is a state relievable by narcotics and tonics with stimulants, and injured by sedatives, in opposition to fever.

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* We may attempt to explain this by the analogy of the starting of the limbs in paraplegia deprived of the influence of the will. Terror produces an effort of the will on the muscles to escape, the fright at the same time causing syncope, or an approach to it sufficient to take off the control of the will; the impulse having been given, the muscular action is then continued in an anormal spasmodic manner by the nervous centres.

Delirium tremens affords a good contrast to fever. This disease is analogous to the state (described p. 77) of a weakened action of the brain induced by forced watching. In delirium tremens the weakened action of the brain is produced by the absence of accustomed stimulants; thus, in those who are in the habit of using much stimulus (of fermented liquors), the heart being accustomed to it, its actions proceed with regularity: when suddenly deprived of it, either from accidental cause, from voluntary refraining, or from its *being forbidden on account of some disease or accident*,*—the want of it causes the pulse to become weak, as if from the operation of digitalis, or other sedatives; the absence of stimulus being equivalent to the influence of sedatives. The brain at the same time is sound, and remains in full activity, but weak from the want of arterial injection, and of the usual stimulus. There is, therefore, a succession of thoughts, rapid but weak (delirium), wakefulness (pervigilium), and weakness of volition, causing trembling, whence the denomination "tremens."† Delirium tremens is a state analogous to that produced by sedatives,* which if slight will pass off, but to which at last, if not relieved, succeeds the coma of inanition and death. The only mode of remedy is by narcotics and stimulants; by which, in addition to the counteraction of the sedative state, a greater tendency to sleep is produced. The stimulant narcotic tincture of opium, or the simple narcotic morphia, should be used—not the sedative narcotic hyoscyamus, which itself may produce delirium tremens (p. 85). At the same time that the patient is using incessant muscular action (jactitation) and raving, the pulse is frightfully weak, both symptoms co-existing, as in persons dying of hæmorrhage: stimulants and opium must therefore be given freely until they counteract this state, and the patient must be confined to his room; for if allowed to run about, as inclined to do, owing to the delirium, syncope will ensue, and probably terminate fatally. When the stimulants or narcotics begin to produce their good effect, we first perceive the brain recovering power, evinced by more steadiness of ideas and rationality; succeeded by calmness, then sleep; and we cannot with safety relax stimulation until the patient does sleep, as the raving will otherwise return. Sometimes the patient will sink into sleep previously to becoming rational; but some degree of calm of the sensorium will usually be perceived first, and increased firmness of the nervous system, evinced by less trembling, &c. There are some cases of delirium tremens which are embarrassing to the practitioner, on account of the brain being diseased, either tendency to apoplexy or paralysis existing, or recent inflammation from accidents, wounds, &c. Under these circumstances alcoholic stimulants cannot be safely used, and in such cases chloroform may be resorted to with benefit, combined with morphia.

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* Young practitioners in medicine or surgery are frequently at a loss to account for the state of a patient under such circumstances, seeing that he is very ill without marked symptoms arising directly from the primary disease. Thus in the case of a gentleman in the habit of living generously, rather high, though by no means intemperately, and whose brain had been during health in a state of constant activity, being moderately leeched and purged, with a very low diet, for common sore throat, on the third day he fell into delirium tremens, which required the copious and long-continued administration of opium, with brandy and water, to subdue it. In a similar manner the sudden change of diet necessary in surgical cases, often brings on delirium tremens in various degrees, both with the rich, and with the labouring classes when brought into hospital, more especially the latter, who, when intemperate, indulge more in ardent spirits. It is only of late years that this state has been thoroughly understood, and even now the gradations of the affection occasionally produce embarrassment.

† I here give but the leading symptoms; the detailed description will be found in the London Medical and Physical Journal, January 1813, and in various works,

Friends or attendants who do not understand the nature of the affection, and have been accustomed to consider that all delirium depends upon what has been called determination to the head, and that depletion is required, have resorted too often to bleeding, purgatives, and other sedative medicines, which increase the malady;

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since that date. A clinical lecture by Dr. Roots, printed in No. I. of the St. Thomas's Hospital Reports, forms an excellent treatise on this subject.

* I have seen delirium tremens produced by large doses of digitalis administered in a pleuritic case.

and they will even remonstrate with the physician sometimes against the exhibition of the only remedies which are efficacious. The bowels are usually torpid in delirium tremens, and will remain so until *stimulants cause them to act*, by restoring that state of the nervous system, in which the nervous principle is developed and distributed to the alimentary tube as to other parts, besides their stimulant agency upon the muscles of the intestines themselves (vide p. 75); and hence the administration of the sedative cathartics is not merely useless, but, by counteracting the stimulants, rather retards than promotes the cure of the patient. The bowels in general act of themselves, therefore, as soon as the energy of the nervous system is restored by stimuli; and when the urgent symptoms are removed, it is time enough to give laxatives, if then required, when the patient begins to take solid food, which he had not done for some time.

This is analogous to the constipation of bowels in tetanus. Has any one ever succeeded in purging a tetanic patient by the most drastic medicines, until the nervous system was relieved? or if patients do recover from tetanus, when purgatives, calomel, aloes, salts, &c. have been administered, may not the sedative effects of the latter have been neutralised by opium and stimulants taken at the same time; or when we find tetanus often fatal, even when opium and stimulants have been resorted to, is it not because the quantity of sedative and drastic medicines has counteracted the effects of the former, which might have cured?

I think, from the various statements already made, it may be deduced, that the diseases of morbid sensibility, were it proved that they depend upon inflammation, are not curable by common depletion: the medullary tissue is too fine to be affected by the force of the circulation, or relieved by taking off the *vis à tergo*, by bleeding, digitalis, &c.; hence neuralgia, tetanus, hydrophobia, chorea, hysteria, &c. must be reached through the circulating fluid, by what have been called tonics, iron, bark, arsenic, &c., combined with narcotics, and with stimulants according to circumstances.

The jumble of treatment usually adopted in tetanus has been such as to defy any calculation as to what has done good: opiates and stimulants have been counteracted by purgative sedatives—hot baths by sedatives—stimulants and narcotics by cold baths; bleeding opposing wine, brandy, and opium. In one remarkable case on record, the patient recovered, after the nurse, by mistake, had given during the night, instead of the medicine, a liniment containing a large proportion of laudanum. Many cases of tetanus have recovered under the employment of warm baths, stimulants, and narcotics; from which, and various analogies, I adopt the treatment by opium in tetanus: if any addition be made, it should be that of tonics and stimulants when required, not sedatives. We have succeeded in finding the mode of curing tic douloureux and delirium tremens, which were once *opprobria medicorum.* Why may we not, by investigation and analogies, succeed at length in curing tetanus with more certainty;* or that most dreadful of human inflictions, hydrophobia?—recollecting that, when the patient cannot swallow, medicines may be introduced into the system, either by applying them to a surface from which the cuticle has been removed by blister or cautery; or internally by the stomach-pump tube, or by enema.

I think one point is clearly made out, that where there is fever, whether idiopathic, or symptomatic from local inflammation—loss of power from lesion of the nervous system, so that nervous influence is deficient,—it is vain to attempt to excite action by stimulants, until, from the cessation of the operation of the morbid poison or the inflammation, or from a state of collapse, or the operation of sedatives, the capillaries of the cineritious substance have resumed sufficient contraction to renew the generation of nervous influence, through which the delirium or coma of plethora ceases; and that, on the other hand, when the nervous system is in a state of morbid sensibility, combined with the delirium or coma of inanition, stimulants and narcotics are directly indicated; and tonics should be added according to circumstances.

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* Since the above was first published, I have had two cases of the disease: the one, locked jaw (trismus) in a debilitated habit, recovered with an opiate every night, and a tonic medicine (inf. gent. co. c. vin. ferri), with nourishing liquid food and fermented liquor. The other, aged seven, traumatic tetanus (locked jaw, with opisthotonos in frequent paroxysms), recovered also. The treatment in the latter case was (third day of the disease) an opiate immediately, to be repeated every night, and a narrow blister along the spine. Fourth day the report was, felt better and bowels acted; but blister appearing to irritate, ordered an enema, with Battley's liq. opii gt. xx., ol. terebinth. gt. xxx. every third hour; the second dose produced calm. Fifth day, better, and jaws relaxing. Sixth, no episthotonos since opiate last night; muscles of neck and abdomen still rigid, bowels confined. A purgative was given by a medical friend, which acted towards evening, producing griping and *return of opisthotonos:* I consequently ordered an opiate enema, with gt. xxx.; a second in four hours produced calm and sleep. Seventh day, no return of spasms; from which time the patient gradually recovered. The amelioration as evidently depended upon the opiate as the relapse upon the sedative (purgative).

There is an analogy between the circumstances under which trismus nascentium usually occurs, and the coma of inanition of infants (p. 78).

A state analogous to delirium tremens is well known to surgeons to occur after accidents and operations, which induces some to give an opiate almost uniformly after an operation; and many formerly used to administer one beforehand, as is now done with chloroform, to prevent the "shock," or exhaustion of the nervous system. This state is occasionally witnessed in hospitals in the persons of patients who have been in the habit of drinking much fermented liquor: but we must not imagine that delirium tremens, or delirium *sine febre*, comes on in those only who use stimulants freely; it will occur under a variety of circumstances where morbid sensibility and over-excitement of the nervous system exists, with exhaustion, or a debilitated instead of plethoric constitution. Cases of this kind occur after parturition, from exhaustion, constituting examples of puerperal mania sometimes misunderstood; in hysteria in hypochondriasis; after apoplexy, or wounds of the head, when much depletion has been necessarily resorted to; after hæmorrhage, sensual exhaustion, over-study, and anxiety. It is but within thirty or forty years that delirium tremens has been recognised and described as a disease distinct from inflammatory affections of the brain requiring depletion; and though experienced surgeons knew how to treat the symptoms when they arose after accidents and operations, it is only latterly that they have been identified with delirium tremens, any more than the medical cases just alluded to.

In these cases tonics are generally useful; and in some, stimulants with opiates are necessary to prevent collapse. In those cases where there is want of sleep, opium is generally preferable to stimulants alone, through its producing the tendency to sleep, without so much increasing the force of the pulse; which may, in some instances, such as the cases after apoplexy and injuries of the head from accidents, be contra-indicated, on account of the risk of increasing local injury; and in which the preparations of morphia are most valuable, being unstimulating. It is in such cases only that the abstraction of blood is admissible, though some practitioners still incline ot the practice, as well as purging, in delirium tremens. The results of my experience are decidedly opposed to them. When the case is complicated, with diseased brain, there may possibly be a necessity for the abstraction of blood with caution; and, in such cases more especially, the narcotic must be relied upon, in preference to stimulants: the administration of the narcotic in a full dose is then indispensable immediately after the depletion.

In many other instances of nervous disease besides delirium tremens and tetanus, opium opens the bowels: it will do so in diabetes, in which the increase of secretion of the kidneys is at first functional disease from sympathetic morbid sensibility, analogous to that in hysteria, or from teething; it will do so in colica pictonum from white lead; and in other cases of colic from sedative. On the other hand, it is well known that it will stop the diarrhœa of morbid sensibility from sedatives; so that what Celsus said of venesection, we may say of opium, that it relieves obstinate costiveness, as well as obstinate diarrhœa: but these merely empirical assertions, without explanation (p. 126 et seq.), might lead, on the one hand, to the injurious employment of sedative antiphlogistic treatment in colic; or, on the other, of narcotic remedies in enteritis, without sufficient antiphlogistic treatment.

Many cases of mania are delirium *sine febre*, and would be aggravated by depletory or sedative treatment, and the patient would either die, passing into the coma of inanition: or, when the constitution began to give way, a change might take place, and a febrile relaxation of the capillaries of the brain change the entire character of the complaint; as we know deranged persons have become sane (or, as it has been quaintly denominated, had "a light") before death. This, as to proximate cause, is the reverse of what I have elsewhere described as taking place sometimes in the crisis of fever.

Local inflammation sometimes produces fever, but at others general or constitutional morbid sensibility ("irritation") which are different states, but alternate and pass into each other; so that we are obliged to vary our treatment according to circumstances. For instance, as in surgical cases, so long as the inflammation produces fever, we use antiphlogistic means; but when the character of the symptoms changes, and morbid sensibility prevails, as when tetanus occurs, we must resort to narcotics, with tonics and stimulants.

Again, visceral disease converts ague into continued pyrexia. Pulmonary consumption is accompanied by hectic, a mixture of morbid sensibility and pyrexia, from inflammation, to which the term "irritative fever" also is sometimes applied in surgical cases.

Thus we see that inflammations destroy life in various ways: some by fever alone, as the acute inflammatory diseases—such as phlegmon, and the results of accidents; others, besides inducing fever, interfere with the functions of the organs, as peripneumonia, pleuritis, and enteritis; a third set, again, kill by morbid sensibility and wasting, as those which induce hectic; and a fourth set by the consequences of morbid sensibility alone, as tetanus and hydrophobia. The constitutional disturbance of cancerous disease has more the character of morbid sensibility than of fever. Fever is not a higher degree of disease than morbid sensibility, since the latter may prove fatal without fever, as we see in tetanus, epilepsy, &c. This important distinction between fever and morbid sensibility will be found useful; and I believe, if followed up, may lead to more definite and successful practice in many cases than has hitherto prevailed.

Inflammation, at least so much of it as to cause perceptible change of structure, is not absolutely necessary for the production of morbid sensibility; for though there be some slight inflammation preceding or causing hydrophobia or hysteria; fright, as we have observed, will produce the diseased state of morbid sensibility in so great intensity as instantaneously to produce epileptic convulsions, without discoverable change of structure in the nervous centres, though morbid sensibility remain permanently, as evinced by the returns of the epileptic paroxysms. We see convulsions arise from morbid sensibility, without any degree of inflammation calling for depletory remedies; but which, on the contrary, are aggravated by them, as we find hysteria increased by debility, and hysteric convulsions brought on or increased, when, for some really inflammatory affection, we are obliged to deplete a patient who has tendency to hysteria; and in these cases sometimes delirium, with pain of head, comes on, simulating phrenitis, but which is mere morbid sensibility, curable by tonics, with or without narcotics or stimulants, and not by the treatment which cures phrenitis, though the skin be flushed. These examples suffice to shew the necessity for making a distinction between a state of constitutional morbid sensibility and symptomatic fever; so much resembling each other in some respects, and yet requiring such opposite treatment for the safety of the patient; and, moreover, as it was shewn that these states run into each other, the treatment must sometimes be suddenly varied.

This may be illustrated by some cases in which severe morbid sensibility was the urgent symptom, depending, however, upon different causes, and therefore cured by opposite treatment.

A boy was brought into the London Hospital who had been confined to bed for some time with a swelling of the knee, attended with constant pain. He had been for some days under the care of Sir W. Blizard when I saw him: he was much emaciated, irritable, and languid; consumed by symptomatic feverishness; got no refreshing sleep from opiates; the pulse 130, thready, or rather wiry—very hard. He was too weak to bear more leeches to the knee, although that was hot, red, tender to the touch, and did not admit of the slightest motion, being kept constantly bent owing to the pain. The indication was, to take off the injecting force, as the vessels could not be otherwise relieved; fifteen drops of tincture of digitalis were ordered three times in the twenty-four hours. After the second dose, he got better sleep than he had from the opiates (p. 98, l. 3)—the pulse becoming immediately slower; and in less than a fortnight he grew stouter, as the swelling subsided, and was able to walk home.

A medical student had swelled knee without redness, with great pain, preventing rest. He was treated *secundum artem* by several practitioners, amongst whom was one of our best surgeons. He had not fever, did not waste, but was tormented with pain, and sometimes with painful applications, besides occasional purgative and other sedative medicine. One night, in despair, he took a sup—what he imagined to be about a tea-spoonful (sixty or seventy drops)—from a bottle of tincture of opium; after which he slept twelve or fourteen hours, awoke free from pain, and very soon walked to the hospital without more medicine.

I may mention another case worthy of attention, as not of unfrequent occurrence, and of the nature of which it is of great consequence to be aware. A young female had, for two or three weeks, been treated by bleeding, neutral salts, and low diet, for what was called determination to the head, supervening upon a supposed pleuritic affection. When I saw her, there was jactitation; sense of oppression at the chest; incoherence of speech; severe pain of head; occasionally causing her to put her hand to it, and to cry out; intolerance of light and sound; flushed face; weakness, but not sluggishness of the voluntary motions;—there was no fever; the pulse was jerking, as we find after hæmorrhage, but not firm; the tongue not foul, but white as we always find it with an empty stomach.* I ascertained the pain to have been at first in the *left* (p. 109) side; and, from other hysterical symptoms, felt satisfied that the present state was clavus hystericus of the head, kept up by inanition. She

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* I say, always; and there is not a more common error than that of considering this natural appearance morbid. Thus, persons who are in the habit of thinking themselves "bilious," and taking physic, look at their tongue when they rise in the morning, and find it white. A good breakfast will make it look red, unless they take a dose of salts, or seidlitz powder, and sometimes even whether they do or not. The same persons will perhaps put out the tongue before a looking-glass just before dinner-time; and, seeing it white, forego a part of the wholesome meal which would bring the tongue to the natural colour of redness which it assumes after eating, from its natural paleness before eating, unless they be gourmands and hypochondriacs at the same time; in which case they will run the hazard of eating, and take a calomel "peristaltic persuader" afterwards. I have been constantly in the habit of warning my young medieal friends to consider, when they see a white tongue, what time of day it is, and *not to purge* for merely a white tongue, or more properly a *pale* tongue.

The tongue is constantly very properly inspected in disease, as it affords an evidence of the state of the mucous membrane of the stomach and bowels, with which it is continuous. In health it is not of a bright red, but has a pale pink bloom on its surface, in consequence of the tips of the villi or papillæ being less injected with blood than the lower parts; when the stomach is empty it contains less blood, its villi are of course paler, and those of the tongue are nearly white: but observe, the tongue is moist; whereas, in the beginning of synocha or pleurisy, or other inflammation, the stomach is empty from anorexia, and the tongue is white: but it becomes dryer than from a mere empty stomach, and more or less coated, arising from the evaporation of the watery parts of the saliva and mucus of the mouth, which leaves the membrane indued with a more viscid covering than natural. After eating, when the stomach is in a state of healthy activity, the tongue becomes redder; but still it is not of a bright-red hue, which only takes place when the membrane of the primæ viæ is in a congested or inflamed state, as in dysentery, in phthisis when colliquative diarrhœa exists, at the termination of typhoid fever when there has been (in reality) gastro-enteritis or inflammation of the glandulæ agminatæ, &c.

In the progress of severe fever, when the secretions are suspended, the tongue becomes dry, and the mucus which does exist dries, and forms a brownish or blackish had been allowed the day before a little weak chicken-broth; but as she became worse, it was supposed she was unable to bear even that, which caused me to be consulted. Wine and animal food immediately and gradually administered, without any medicine except a few drops of vinum ferri, soon calmed all the symptoms of what was called inflammation and determination to the head (p. 161, line 22); and health was restored in a few weeks.

These three cases will illustrate several points. We see, 1. Local inflammation producing morbid sensibility and symptomatic fever; hence food and wine afforded no nourishment, narcotics no rest (as they would have done, had there been only morbid sensibility without symptomatic fever). Cured by a sedative—digitalis.

2. Local inflammation producing, not fever, but general morbid sensibility, chiefly evinced by loss of sleep, no indications for stimulants, sedatives, or tonics, and no want of strength or appetite. Cured by a narcotic,* which, by procuring sleep, gave the nervous system time to regain its natural state, so as subsequently to give energy to the vessels of the inflamed part.

3. Local affection (chronic hysteritis) having produced, not fever, but constitutional morbid sensibility—hysteria; debility, arising from depletion and want of nourishment; so that narcotics could procure but temporary relief, as they afford no nourishment, and sedatives aggravated the delirium of inanition. Stimulants and food, by giving strength, acted as a tonic, and restored power to the nervous system, and consequently to other parts; and, moreover, the stimulant gave almost instant relief, by counteracting the over-sedatived state of the capillaries of the brain.

A chronic painful (neuralgic) state of the brain comes on, essen-

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crust, and the papillæ become so much shrunk down to the level of the rete mucosum, that when the tongue becomes clean, on recovery, it looks glazed and smooth, and some time elapses before the papillæ rise up again.

In chronic affections, accompanied with a languid and flabby state of the primæ viæ, a discoloured state of the mucus occurs, constituting what is called a foul tongue.

* I have shewn here how a narcotic alone can effect a cure. It is in this way that it cures tetanus, or sometimes with a tonic combined. The narcotic, in some instances, gives only temporary relief, as in tic douloureux, which it is necessary to cure by a tonic; but it may be inferred that this relief promotes the cure, inasmuch as I have shewn that the relief by a narcotic alone, in some instances of morbid sensibility, effects the cure.

tially connected with debility, from a variety of causes—fatigue of body and mind accompanied with indigestion, hysteria, malaria in aguish districts, &c.; this state is often misunderstood, and is sometimes with difficulty treated, even when understood, on account of the opposition of the patient in most instances to take stimulants, the gradual introduction of which into the system is absolutely necessary. Such patients have a dread of what they call fulness of the head, which is in truth a false sensation depending on morbid sensibility. The temporary uneasiness, or pain produced by stimulants, besides the accompanying dyspepsia, renders the use of much persuasion necessary to overcome the objection entertained to taking them when prescribed. This state often arises in delicate persons of either sex.

A friend of mine came to town for the purpose of consulting me, in consequence of what he and his medical adviser considered determination of blood to the head; that is, occasional giddiness and headache, with some dyspepsia and depression of spirits, more severe after breakfast (that is, particularly after partaking of a sedative, tea,) than after dinner. For these symptoms, although a slight person, he had been physicked, kept on restricted diet, and debarred from fermented liquors, entirely with his own concurrence, as he apprehended apoplexy. He is a member of one of the learned professions; and it appeared to me that he was labouring under a neuralgic state from study and over-fatigue. He was convinced of this by my representation; and in about a couple of months was restored to health, by gradually resuming a generous diet with tonic medicines. Chronic neuralgia of the heart, often mistaken for hypertrophy, &c. occurs under similar circumstances, and requires similar treatment.

Though keeping the bowels moderately open is useful in chorea, and in a variety of nervous affections, to promote the digestion, constitutional morbid sensibility, hysteria, &c. are always aggravated by debilitating agents, especially by abstraction of blood; so that, until food and tonics give strength, no cure can result. Now, sometimes in neuroses the patient cannot eat, any more than in fever, though from a different cause: in fever there is anorexia, from a congested state of the mucous membrane of the primæ viæ, and the obtunded state of the nervous system in general, and of the nerves of the stomach in particular; in the neuroses, from morbid delicacy of the senses of taste and smell, or sometimes from morbid sensibility of the primæ viæ, the first mouthful swallowed produces a sense of repletion; and this nervous anorexia sometimes increases the difficulty of distinguishing between fever and constitutional morbid sensibility; and particularly when the primary local affection is in the primæ viæ, from indigestion stimulating inflammation of the mucous membrane (gastro-enteritis).

In distinguishing actual fever from morbid sensibility, which is of so much consequence, we must not confound that languor which arises from nausea and other affections of the primæ viæ, such as diarrhœa, &c., with the languor of want of power of volition, from the weakened nervous system of fever.

Morbid sensibility is an affection of nerve; but nerve, considered in relation to disease, is nothing without capillaries—capillaries nothing without nerves. The isolated consideration of either leads to the error in practice of attempting to relieve the vessels at the expense of the nervous system, or of resorting to nervous medicines exclusively, to the prejudice of the vascular system.

What I mean by mere nervous medicines is, in the common acceptation, anodynes, which allay sensation for the time, but, having no effect on the vascular system, do not cure the disease; neither will tonics have the effect in many cases, without skilful adjustment of the secretions, digestion, &c.

Apoplexy and paralysis depend upon disease of the nervous centres, produced by mechanical injury or spontaneous inflammation, or congestion only; and may either be cnred, and the paralysis pass off; or, the usual results of inflammation, tumours, abscess, effusion, softening, &c. may cause the paralysis to be permanent. As the nervous centres are hidden from inspection, we cannot discover the degree of lesion; we ought therefore to persevere in our efforts to cure, which will often at a late period be crowned with success. The principles of treating these injuries of the nervous system, recollecting the importance of the organs involved, and the necessity of energy in acting, and care in watching the phases of the disease, are precisely the same as the treatment already laid down for inflammation in other parts of the body, though a mystery was attached to them by the ancients, and a much too depletory and lowering treatment was formerly indiscriminately employed, and frequently with an entire neglect of tonics, from the fear of their being stimulant, except mercury, which was not considered a tonic, though I have shewn it to be one of the most powerful (p. 91).

The principles of treatment, I repeat, have been already laid down—in acute cases and plethoric patients active and decided antiphlogistic and anticongestive—in passive inflammatory states, that is, with debility of constitution, just barely enough of local depletion of vessels;—with tonics, and even stimulants, when the constitution and the stomach require them; and a long and steady perseverance in the appropriate remedies, with a careful attention to the ebb and flow of power in the constitution.

The point to which I particularly wish to direct the attention of the practitioner is, that there occurs in old people a paralysis from mere debility of the nervous centres, from local congesiion, without either inflammation, softening, tension, rupture of vessels, or other organic injury, and which will appear sometimes on one side, and afterwards on the other. These cases will recover under gentle and judicious attention to the constitution, by careful non-stimulating support and tonics, including a cautious administration of mercury. I have treated many old persons in this way, adding digitalis when there has been a strong hard pulse, and have effected their recovery from paralysis, which had existed, first of one side, and afterwards of the other, and had depended upon mere temporary local congestion; which was proved, when they eventually died from some other cause (general dropsical symptoms, &c.), as no organic disease of the brain was discoverable.

In advanced age this chronic disease of the nervous centres sometimes produces a sufficiently evident paralysis, hemiplegia, paraplegia, or partial paralysis, sometimes combined with affection of the sensorium, sometimes not. But the symptoms of affection of the spinal cord are also sometimes obscure; and I have seen the muscles of respiration and circulation attacked periodically, so as to simulate (and be called) spasmodic asthma, the respiration being besides permanently though slightly embarrassed. This I have known take place from obscure chronic disease of the nervous centres, and is precisely analogous to those symptoms which arise from the disturbance of the spinal cord produced by evident curvatures of the spine.

I commenced the pathological part of this work with the consideration of the nature of inflammation, and the principles of its treatment; and having afterwards discussed the nature of the two grand groups of diseases which constitute fevers and neuroses, and shewn that, although they are both essentially affections of the nervous system, they are widely different from one another, I propose now to add a few observations upon some particular diseases. Although, in discussing their proximate causes, I may be met by doubts on the part of some of my readers, from the novelty of some of the opinions advanced—which it may require farther observation to substantiate,—yet their practical utility, or the principles laid down for their treatment, will not be founded on a less solid base than those which concern the treatment of inflammation, fevers, and neuroses in general.

There will have been observed nothing of humoralism in the preceding pages; for though I admit the influence of imperfectly assimilated nourishment, and its consequent deterioration of the blood chemically, producing gravel or scurvy, &c.; I ascribe the effects, whether remedial or noxious, of agents, mineral, vegetable, or animal, taken into the circulation, to their producing changes of the solids. All *diseases*, in fact, commence, as I have already repeatedly said, by disturbance of the function of the solid parts of the machine; and, first of all, of the nervous system. This is solidism, or neuro-pathology.

The nervous system, it is superfluous to repeat, regulates and supplies all with energy. There is no organic sensibility, or organic contractility, independent of the nerves. Every natural impression is received by the nerves; every morbid agent is first felt by, and operates upon the nerves. Inflammation of cellular tissue, bone, conjunctiva, &c., through mechanical or other violence, result, as we have shewn, in consequence of injury to the peripheral nerves and to the capillaries; fever, from injury to the centres of the nervous system, which arises either from peripheral injury propagated to them, or through lesion by miasma, which, by the route of the circulation, directly poisons them—most probably by chemical combination and alteration,—instantaneously lowering their power or energy. I have shewn throughout, that the immediate effect of the lowering of the power and energy of the nerves or the nervous system is inflammation, or congestion of the capillaries, the first degree of inflammation.

The diseases of morbid sensibility (neuroses), we have seen, depend also upon a partial or general derangement of the nervous system; arising, when general, either from the disordered state being propagated to the central organs from a distant region of the body, as from a wound, in traumatic tetanus: a poison, in hydrophobia: from the uterus, in hysteria, &c.; or originating there through the gradual operation of a debilitating cause, as delirium tremens, paralysis agitans, idiopathic tetanus, chorea, &c.; or when general morbid sensibility is suddenly produced by loss of blood or fright;—so that neuroses, as well as fevers, may be produced suddenly or gradually, and, like them, may be either idiopathic or symptomatic.

Fever essentially depends upon a diminution of the power of the nervous system—the nervous influence, whatever that be, is deficient; whereas the diseases of morbid sensibility appear to arise, not from a want of sensitive and motor nervous energy, but from a derangement of the machinery of the nervous centre, or a disturbance of that connexion of the nervous centres with the nerves, which not only induces, but regulates action. Thus, neither in tetanus nor hysteria is there deficiency of power either in the nerves or muscles—as the morbidly increased sensibility, and the powerful spasms and convulsions shew—but a derangement in the direction of it.

In fever there is a want of steam, or moving power, to use a mechanical illustration; in the neuroses the machinery is out of order: for instance, when fever is fully established, sensibilities of every kind are blunted, both what are called animal and the organic; and there is debility also of the voluntary and involuntary muscular systems.

In the diseases of morbid sensibility, epilepsy, tetanus, neuralgia, hysteria, chorea, hydrophobia, &c., either all the sensibilities, animal and vegetative, are rendered morbidly acute, or the motor energy is distributed to the muscles irregularly, if not too abundantly; as we see in chorea and paralysis agitans, volition would guide the hand to the mouth, but in consequence of the deranged nervous centre, the hand is thrown in other directions, in spite of the will, from the antagonist muscles not being under its direction. Or the derangement of the functions of the perceptions and volition, as well as of "incidence and reflexion," is simultaneous, as in hydrophobia, and some cases of hysteria.

In fever there is abundant evidence of lesion of the cineritious tissue, interfering with its function, the generation of nervous energy: in morbid sensibility we have only an evidence of deranged actions in the distribution of it in the medullary white tissue. In morbid sensibility we do not find the faculties of the sensorium seriously interfered with, unless when, in the advanced stages, a degree of fever comes on, and induces the delirium or coma of congestion; or when, on the other hand, inanition produces delirium, as in hæmorrhage, delirium tremens, &c.

Among the diseases which I intend hereafter briefly to discuss, are, firstly, ague, cholera, and influenza—allied naturally to fevers, but which I have preferred considering after the diseases of morbid sensibility, inasmuch as, following what I have said upon these, and concerning the use of sedatives, their treatment will be better understood. Afterwards I shall say a few words upon some other disease, as those affections of the skin and fibrous tissues called erysipelas and rheumatism, upon phthisis, and on those diseased states of the capillaries which produce catarrhs, dropsy, hæmorrhages, and chronic cutaneous eruptions.

I will not enter here into the description of ague, as I am not writing for those unacquainted with the meaning of the term, but for such as have learnt it from lectures, books, or observation; and under the denomination of ague I include remittent, as well as what are called intermittent fevers.

Ague is essentially fever; it forms, however, a connecting link between fevers and neuroses, as a considerable degree of morbid sensibility exists in it. Ague is, besides, closely allied to Asiatic cholera and influenza, which are also essentially febrile diseases, as I demonstrated in 1832, when we had daily opportunities of seeing the former epidemic.

I consider it of the greatest consequence to investigate these connexions of diseases, which are separated by nosologists. In fact, the very close examination of them for this purpose increases our intimate knowledge of them, enabling us the more easily to form a diagnosis ; so a schoolmaster distinguishes his scholars, or, more surprising still, a shepherd knows the individuals of his flock, though to another person they are "*πάντα ἀμενηνὰ κάρηνα.*" By shewing points of essential coincidence in diseases which are separated by nosologists wide as the poles, we shall account for those individual diseases, though antipodes, being benefited by the same remedies. Let us just reconsider, what are the essential symptoms of fever, whether, in its course, it assume the form of intermittent or remittent, synocha or typhus—those symptoms which it is of consequence to remove ; and the efficient means of doing so.

The urgent symptoms are those of debility of body, or of body and mind together. Let us not have our judgment obscured by the numerous and varied non-essential, though sometimes even epidemic superadditions: as in one case there will be costiveness, in another diarrhœa; in one case full pulse, in another weak ; in one case hot skin, in another cool; in some cases accidental inflammation of one part, in others of another ; all of which non-essential superadditions must, notwithstanding, receive their due share of attention, as aggravating the case. But the patient will recover from the fever, if we relieve his debility of body and mind: that debility we have shewn to be caused by an overloaded state of the nervous centres; and we uniformly see that the only successful means of relieving them consist in diminishing the injecting force when the pulse is strong, and, at the same time, increasing the contracting action of their capillaries by antimony, mercury, salines, bark, &c. &c. ; or even when the pulse is not too strong, we find bleeding sometimes necessary to diminish the actual quantity of the load, as the constringents alone may not be sufficient to produce contraction; so that, with reference to the indication of bleeding, we have much more to consider the state of plethora of the internal vessels than the state of pulse or *vis à tergo*. And though emetic substances have an influence similar to that of bleeding, in lowering the *vis à tergo*, they are, nevertheless, of most essential advantage when the pulse is even almost gone, by their immediate constringent effect on the internal capillaries: hence it is evident that the pulse, which was so long considered as the indication for the use of bleeding or sedative medicines, is often alone no guide at all;* in which cases the necessary practice by sedatives, from having been hitherto unexplained, has always been called indirect practice. I do not admit this term, and never practise indirectly: my indications are always founded upon physiology, as I have explained them up to this point.

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* There are so many exceptions to the general rules respecting the pulse, that although every one feels the pulse, it requires long experience to avoid being misled by it. I will, therefore, in this place, endeavour to lay down some principles for the removal of the difficulties in the way of this source of diagnosis.

In the first place, as traced above, increase of frequency and force (hardness) is produced by inflammation: when the inflammation is in an external part, the pulse is usually strong; when the inflammation is in the internal organs, there is not so much evident force, the pulse is small and hard, sharp, wiry; and this wiry feel may be very small, yet still evincing a degree of force in the contraction of the heart from its morbid sensibility, though the organ is felt contracting on a small quantity. Now, we must be on our guard that this same, or even a greater degree of internal inflammation may exist, and yet, as shewn above, from depression of the vital powers,—as, for instance, when the lungs are gorged in peripneumony,—the pulse may feel quite feeble, from the blood not being arterialized, and therefore not stimulating the heart to contract. In such a case, venesection, by allowing freer circulation through the lungs, will increase the stimulating properties of the blood, and raise the pulse and vital powers. Here we ascertain the condition of the organs by auscultation, the colour of the lips, and other symptoms, and decide in opposition to the pulse.

On the other hand, various neuralgic states produce a frequent and strong pulse, which, though ordinarily an evidence of inflammation, indicating bloodletting, must be disregarded, as bloodletting would be injurious. In these instances we must be guided much by the previous history of the case; and be cautious not to be misled by the symptom of pain, if the patient be nervous, and if the various usual accompaniments of the inflammation, which is simulated do not present themselves. Thus, in hysteria, symptoms sometimes mistaken for peritonitis arise. In the hysterical affection, less obstinate constipation and less dryness of skin exist; the tongue is generally less dry, though it may assume almost any appearance; but the pulse in hysteria is less wiry than in peritonitis: the same may be said of the pulse, skin, and tongue, in the assemblage of hysterical symptoms resembling pleuritis. In inflammation of the heart which is often unfoundedly dreaded by hysterical patients· the pulse is soft, like the pulse of acute rheumatism, as the inflammation renders it weak; so that it allows of distension, and has not power to empty itself. When we find the pulse of natural frequency, full and hard, we must suspect organic disease of the heart; for unless that exist, the pulse is full and soft, or frequent and hard, or frequent and soft. There is a frequent soft weak pulse, with dilatation of the left ventricle: but the practitioner must make himself acquainted with the peculiarities depending on the diseases of the heart itself, as one means to prevent his being misled by the pulse.

We must again separate clearly in our mind phenomena from causes: for instance, rigors, cold shrunken skin—the causes of which was said by Cullen to be spasm of the extreme vessels; the contracted state of the latter is, however, mere effect, not cause: convulsions again, are the mere result of morbid sensibility, and have no direct connexion with the fever; on the contrary, they have been considered by experienced men rather favourable in the eruptive fever of variola.

What are the steps from the invasion of the poison till the development of the fever? The first is a debilitating influence on the nervous centres: the mind is at this time clear though languid; the pulse is small, the skin cold, and the limbs tremble, or are convulsed, from the morbid sensibility of the nervous centres, evinced also by pain in the head and spine. From the weakness of the circulation, therefore, all the external capillaries contract, not by spasm, but by their natural contractile action—through not being sufficiently injected; the blood is consequently congested in the internal parts of the trunk, producing nausea, and other disturbance of the primæ viæ, augmented by the morbid sensibility of the nervous centres, sometimes causing vomiting and diarrhœa.

Now, this is the first stage of fever; in which, if the dose of poison has been sufficient, death has been known to occur, and that very suddenly, not only in the "Bombay fever," in which the patient became at once cold, and died in this first stage of chill, but also, as it has been stated, in the severe yellow and other fevers, in which patients have died at once, without any reaction or rallying; as, for instance, soldiers have dropped on parade and died almost immediately: the heart having been unable to propel the blood to the brain, fatal syncope or asphyxia has ensued.*

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* From the histories of fevers, and from observation, it is apparent that the poison of continued fever is generated by animal matter, as in crowded ships, jails, &c.; the poison of ague and remittent fever by vegetable matter, possibly some cryptogamous species, as those fevers prevail chiefly in situations where these are met with, such as marshes, uncultivated places, &c. When marshes are drained and cultivated, the cryptogamia are destroyed, and agues are not generated. The tremendous remittents of hot climates appear chiefly where the ground is at times covered with water, and where, after the rains have subsided, it remains half-wet

This stage of *depression* may last for minutes, hours, days, or weeks, as evinced in the ephemeral continued fever, regular agues, and those irregular agues vulgarly called "dead" ague, to be described hereafter.

The next stage of fever is commonly named the hot stage; but as that designation is totally inapplicable to typhous fevers, I prefer the term relaxed, as that implies the actual state of prostration of nerves and capillaries, which is so evident, and which I consider the proximate cause both in "synocha" and "typhus." The severity of this stage will depend entirely upon the dose of poison and state of constitution; whether, for instance, the individual will return to a state of health immediately, with but a slight degree of languor for a few hours after the chill; or whether the phenomena of a continued fever, or the hot fit of an ague, will result, owing to the poison having been sufficient to cause the more permanent relaxation of the capillaries of the nervous centres.

It has been previously shewn how sedative influence ultimately produces relaxation, which state now ensues in the nervous centres; and it will depend upon how much they are relaxed, whether the fever will be hot or not. If too much relaxed to allow of their secreting nervous influence, as when the fever is typhous, the circulation and respiration will not have power to produce a full pulse and hot skin; if otherwise, we shall have flushed hot skin, as in continued fever and in ague. But in either case the skin will be reinjected; for even in typhous fever, though the heart be weak, the superficial capillaries, having lost their tone from deficiency of nervous influence, relax, and are refilled even by the weak heart with a dusky blood. And a similar state may be seen in some agues, where, after the chills, there is a typhous state, and a livid colour of skin, with dreadful languor, as may be observed in individuals with ague in the Pontine marshes. Thus, even in ague, the student must not expect to find always the *hot* stage of the nosologists.

These are the only two stages of fever and ague. There is no third stage of ague: the sweat which succeeds the hot stage is nothing but an indication of renewed secretion by the capillaries, which,

abounding in rank and decomposing vegetable matters, especially amidst uncleared woods.

after having lost their tone, and been consequently in a relaxed, distended, non-secreting state, renew their secretion on being restored to a normal condition; and, of course, as they are returning from a relaxed state, they will pour out fluid sweat at first, until recontracted sufficiently to secrete insensible perspiration—a mere vapour.

It has just been mentioned that the ague exists frequently without shewing the hot stage; in fact, the patient remains in a continued state of depression, with a languid circulation, cold livid skin, and the sensorium more or less oppressed. It is very common for patients in this state to present themselves at the hospital, and, when questioned, not to be able to give any account of their symptoms, as is also the case with them when they apply during the cold stage: in either case the practised physician will see at once that he has before him the subject of ague. Sometimes the patient with irregular ague just described will answer at once, when asked what is the matter with him, that he has the "dead ague," the name given by the peasants to this state of disease, which they know originates amongst agues; and which they also know sometimes turns to regular ague, that is with rigors ("shaking") and sweating. In such a case, when I have asked a patient who did not use the term dead ague, "Have you the ague?" the answer has been, "I wish I had; I should be much better if I could shake out" (outright).

It is an interesting subject for a student to watch the effect of a tonic, such as bark or arsenic, on one of these cases, as the uniform evidence of improvement is, that a paroxysm of regular ague is produced as a first step towards the cure.

I became acquainted with this circumstance in the first year of pupilage. A patient was admitted into the hospital with *cough*, looking very ill and sallow; he was ordered some calomel and squill mixture, with a blister to the chest. The effect of the calomel, the comfort of the hospital, and change of air, was, that the next morning he felt better, and was soon after attacked with a fit of regular ague. This was an early and useful exemplification of the "larvatæ, or masked agues." Plentiful doses of bark (quinine had not then been heard of) cured the ague and cough together.* Men of experience, especially in anguish districts, have seen all the modifications of these larvatæ, such as aguish apoplexy, aguish paralysis, aguish sore eyes, aguish rheumatism (called intermittent neuralgia,* &c.), and which are well described by Macculloch.

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* A lady consulted me on account of troublesome cough, uncertain as to expectoration, occasionally rather dry, and sometimes producing towards evening difficulty

of breathing, which lasted generally through that night until towards morning, when profuse perspiration came on. She and several of her friends apprehended tubercular consumption, some of her brothers and sisters having died of that disease; other persons told her it was spasmodic asthma. The tongue was very slightly coated, the pulse above 100, and the skin rather dry: these were some of the symptoms of consumption; but the stethoscopic signs of either asthma or tubercules were absent, and I remarked that the colour of the skin was rather muddy and sallow. As she had been my patient before she went abroad, I asked if she had not had "the fever" (ague) in the West Indies, whence she had returned about five months. She said she had, and had not felt quite strong ever since: upon which I decided that she had caught cold (catarrh) upon the dregs of an ague, and therefore gave her quinine to cure both together, and a little mucilage with squills and syrup of poppies to pacify the cough when troublesome, and allowed her to go into the country. In about a week she returned, saying she felt much better, but had had a regular fit of the ague the day before. I desired her to double the quantity of the quinine, and assured her that she would be well in another week. She objected that a mutual medical friend had told her she must leave off the sulphate of quinine, as it was not safe to take it with such a cough. By following my directions, however, she was quite well in ten days, and has continued so now five years.

* In the last note I gave a case of masked intermittent; I may now offer one as a caution against confounding inflammation with neuralgia. A gentleman. aged forty-five, caught cold, which was followed by a cough and severe pain in the head, shooting from the right eye to the back of the head, which was aggravated when he coughed or walked, and at those times extended to the top of the head; pulse generally about 100, hard. When this state of things had existed some weeks, his medical attendant called in a celebrated veteran physician, who prescribed guaiacum for the pains, considering them rheumatic. After this he was cupped on the neck to fourteen ounces, without relief. In about a month he found the sight of the eye weak; the pains became excruciating, especially periodically from one o'clock A.M. till six, and he got no sleep; even during the day the pain would not permit him to read or write. Another physician was now called in, who administered anti-neuralgic medicine and laxatives for about three weeks unavailingly. The gentleman's ordinary medical attendant consulted me at this period, and I recommended bleeding, considering that there was chronic inflammation of the membranes at the base of the brain: but the patient refused to allow it, partly on account of feeling so weak, but principally because he had had an increase of pain after the cupping, though I expressed my opinion that that was merely because the cupping had not been sufficient. My diagnosis was soon confirmed by the occurrence of paralysis of the eyelid and of all the muscles of the eye except the trochlearis (which may be accounted for by the root of its nerve lying about a finger's breadth out of the line of the other nerves where the inflammation ran); there was also a degree of deafness, besides numbness and pricking in the side of the nose, cheek, lip, and teeth. A consulting

Ague frequently degenerates into continued fever; and I must add a few words upon the nature and variety of the degeneration. When the fever is of the simple continued kind, synochous, with hot skin, the ague is called a remittent; when it is of a typhous character, it assumes the form I have described as dead ague.

Ague constitutes the link between fevers and neuroses; but in ague, besides the state of morbid sensibility of the medullary tissue, we have abundant evidence of the plethoric congestion of the cineritious tissue also; so that a compound treatment becomes necessary, —different from that of the neuroses, as well as from that of fevers. The sedative treatment which suits fevers suits agues, and more especially the irregular ones; for the irregular dead agues, or remittents, which are deteriorated agues, will be brought to the regular state (if not cured) by sedatives: and this is also the case with influenza, and cholera, which are closely allied to the ague. The reglar agues, which approach more closely to the neuroses, will be, like them, cured by tonics alone, and, like the neuroses, bear stimulants much better than fevers, remittents, influenza, or cholera, which are curable by sedatives, requiring sometimes the addition of tonics in convalescence. In cases of fever, and in all kinds of ague, influenza, and Asiatic cholera, there is an internal congestion of the viscera, including the nervous centres, which is relieved by sedatives; though in regular ague and cholera, from peculiarities which may be explained, stimulants are borne with more or less impunity.

In regular ague, constitutional morbid sensibility is prominent. There exists, it is true, a great degree of congestion of the nervous system, as well as of the viscera,'during the paroxysm, succeeding to a morbid poison; but rarely is real fever produced. There is the pyrexia, equivalent to what occurs in hysteria, but seldom actual

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surgeon was now called in on account of the eye, who recommended blisters and mercurial medicines, but without success; as, however, he coincided with me as to the propriety of bleeding, the patient at last gave way to our united entreaties, saying that he thought himself too weak to bear it, but he could not exist under the pain, and therefore consented to lose "a small quantity of blood." We, however, got away about twelve ounces, which relieved him so much, that he did not object to being bled again repeatedly for some weeks, and occasionally for five or six months, until he was quite well, as he has continued now for about seven years. The eye and its muscles have recovered their functions; but there is still a disagreeable extra sensibility in the skin of that side of the face.

fever—not that loss of power in the capillaries of the nervous system which prevents the generation of nervous influence; for in ague, stimulants, unlike the effect they have in fever, do not produce the coma of plethora—the nervous centres being little injured, though debilitated, are relieved by the stimulant narcotic tincture of opium; and consequently fresh energy is communicated to the capillaries, even in the hot stage, by which they resist the heart's injecting force. Thus we may explain the apparent inconsistency of using venesection and laudanum simultaneously in ague, which has been recommended by some. The venesection, which we know produces the best effects, is not to relieve inflammation, but congestion; and hence it is not often necessary, except, for instance, to relieve some organ, as the brain or lungs, which may be evidently suffering during the paroxysm, through its having been previously in a morbid state, as we see in the hemiplegic modifications of ague, which form an exception to the use of laudanum. In the latter the paroxysms are accompanied by coma or hemiplegia, the brain being previously unsound, though the pulse is weak; as in the state of debility after apoplexy and wounds of the head; and as the aguish congestion passes off, the hemiplegia or coma passes off also, until the renewal of the paroxysm.

Previous to the visitation of cholera in 1831, before I had an opportunity of personal observation, I was led (by reading letters from India, and books) to make a too-limited estimate of the other symptoms of cholera, referring chiefly to the affection of the stomach and bowels (old English cholera morbus) as the cause of the collapse. When, however, I encountered the enemy hand to hand, I saw at once that it was a febrile disease, not merely as regards its epidemic and miasmatic origin, but almost, if not altogether, a fever of a fresh type; and I often thought of what the great Sydenham candidly said of his first encounters with new epidemics. I inculcated, therefore, a treatment in cholera similar to that successfully adopted in fever and ague, and which was carried out with marked success by some of my medical friends in London, Paris, and elsewhere.

I consider cholera an essentially febrile disease, whether it assume the remittent or continued form; that it is not a new disease, but the same described by Sydemham in 1669, and subsequently by Morton and Frank—the same which occurs in Madras, Bengal, Italy, Russia, England, and elsewhere; that when I, as above, use Sydenham's terms, "fresh type" and "new epidemic," I do so not as implying a new disease, but, as he does, a modified form of a disease according to the "constitution of the epidemic in the year in which it occurs;" just as he speaks of the great peculiarities assumed by the identical disease small-pox at different periods.*

Cholera, then, is a species of fever (p. 162). This is already granted by some; to others, who hear it for the first time, it may seem a startling assertion, and, until they are convinced, it will of course be difficult to induce them to use the proper remedies, namely, fever-medicines, and to avoid what is hurtful, *i. e.* stimulants.

Ague is a kind of fever, so is small-pox; the cold shivering produced by internal inflammation is a febrile state. How different is the first accession of these diseases to what occurs afterwards; yet not more unlike than the first cold stage of cholera to the second or *febrile* state, which at first was not recognised, because so many died in the previous cold stage; and even in those cases where death did not occur until the febrile heat commenced, the medical attendant, being generally a novice in this disease, supposed that this (in reality febrile) heat was a beneficial result of the stimulants he had administered.

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* The disease is one of functions, not of anatomical, organic lesions, and the pathology is similar to that of fevers. At first there is no organic change, but an affection of the system conveyed through the nerves; subsequently, during the disease, if it last long, complications may arise, as those of the thoracic or abdominal viscera or brain; neither, any more than in fever, being essentially connected with the disease, though Broussais and Clutterbuck have said otherwise: in these cases, of course, after death morbid lesions are found, but not uniformly the same, though in particular years considerable uniformity exists; as in some years, in epidemic fevers, the bronchial membrane is chiefly affected, as remarked by Sydenham during the epidemic fever of 1685, which he denominated "febris nova;" and which was also the peculiarity of the epidemic fever of the year 1831, in London. In other years, disease of the intestinal mucous membrane and its glands prevails, as described by Broussais; whilst in some seasons and localities disease of the liver accompanies the fever; but if a person were to die on the first day of the disease, who had been sound up to that time, no visceral morbid change would be found. Thus in cholera various visceral lesions have been observed and described which had existed before the attack; but when the viscera have been previously healthy, and the patient has died quickly, nothing has been found except appearances of congestion, and that fur upon the mucous membrane of the intestines resembling a very furred tongue.

The cold stage of what is called "fever and ague" is as like cholera as may be,—cold surface, shrivelled skin of hands, livid face, crampy pains in the limbs, pain in the stomach, headache, faintness, nausea or vomiting, and sometimes diarrhœa, in which latter case, of course, little or no urine is passed.

At the accession of small-pox, the patient is violently sick, with shivering, and pains in the stomach, back, head, and limbs.

A patient with suppurative inflammation of some internal organ,—the liver, for instance,—will become pale and cold, the hands and feet cold as ice, his teeth will chatter, and the whole frame shiver; he will also have the pains in the head and back, and faintness. In such cases as the latter, the medical man, having previously known the existence of the inflammation, which has arrived at such a height as to produce these symptoms, does not attempt to relieve the patient by hot brandy and water, but rather strikes at the root of the disease, the inflammation, by what are called fever-medicines—antimony and salines, with leeches, &c.

When the shivering, sickness, and pains preliminary to small-pox commence, will the practitioner, if he be aware of the nature of the case, give hot brandy and water? Will he not, on the contrary, try to mitigate, by fever-medicines, the feverish symptoms which he knows will supervene?

In the cold stage of ague, it is well ascertained that nothing cuts short the shivering, and other miserable sensations, so effectually as an emetic, and that it does so without the aid of any artificial external heat.

Thus we see, that when medical men are thoroughly acquainted with a disease, they follow in many instances that practice which is called indirect, and is the most efficacious. Such indirect treatment I know to be the most successful in cholera, the appropriate treatment for this disease being:

Water, half a pint.
Tartar emetic, two grains.
Sulphate of magnesia, half an ounce. Mixed.

The dose is, for an adult (from fifteen years upwards), a table-spoonful every half hour; for a child of a year and a half or two years, a tea-spoonful; and for the intermediate years, a proportionate dose.*

External heat is useless. I have found the attendants scalding their hands in applying flannel wrung out of hot water, bags of hot bran, and other fomentations, without effect; these I have always put aside, and, generally, by the time the patients had taken the third dose (if not before), they have described a sensation of warmth creeping over them. The first or second dose usually begins to allay the nausea and diarrhœa.

I am not so absurd as to assert that this treatment is infallible, there being of all diseases, as scarlatina, small-pox, jungle-fever, cholera, &c., different degrees; from that which kills in three or four hours, to that which never confines the patient to bed: one individual will be so slightly attacked as to be able to walk about during the whole course; another dangerously, but still within the reach of medical skill; a third mortally—the dose of the morbid poison of the epidemic imbibed by the patient being so deleterious that no human aid can avail, any more than if a cannon-shot had passed through his body; the violence of the attack resembling the severe epidemic fevers (see p. 182) of hot climates, wherein soldiers have been known to drop down on parade, and die in a few hours.

Cholera patients should be allowed to drink freely of quite cold water; it is the only beverage agreeable to them, and is useful in relieving the sickness and other symptoms. As soon as the urgent symptoms are checked, it is useful to give five grains of calomel, because the liver suffers similarly to what it does in ague; but if the calomel be taken before the vomiting is stopped, it may, of course, be lost. Bisulphate of quinine, also, should be administered from the first day, analogously with ague; and as long as the skin continues dry, and warmer than natural, as alluded to above, half a dose of the fever-mixture should also be given each time with the quinine.

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* It seems almost superfluous to remark, that these minute doses of neutral salt act, not as a laxative on the bowels, but as a diuretic on the kidneys, the secretion of which is uniformly suspended in true cholera. This, however, is not all; the saline coincides with the antimony (tartar emetic)—the best established of febrifuge medicines—in counteracting the disease.

The diet should be nutricious, but light, as the tone of the stomach is greatly diminished; at first nothing is better than milk mixed with water, arrowroot, gruel, &c., given cold, until the patient's own sensations make him prefer them warm, which is evidence of a return to a more healthy state; in this respect the patient's own wishes must be attended to.

Dry friction seems to be the only useful external application.

When the fever-medicine cannot be quickly obtained, it is well to be acquainted with a ready substitute. The following will be found to have much influence, though it certainly is not so efficacious as to allow us to dispense with the previous mixture, if it can possibly be procured.

Half a pint of water.
A large table-spoonful of common table-salt.
A large table-spoonful of flour of mustard. Mixed.
The dose the same as of the former.

Mustard is a well-known emetic; but it is not because it, or tartar emetic, or ipecacuan, or sulphate of zinc, &c., in large doses, produce vomiting, that they give relief, but because the emetic substances and salines, in divided doses, have an effect on the nerves and capillaries of the primæ viæ, that counteracts the effects of the epidemic poison which produces the phenomena of cholera, ague, and other febrile states.

Several other prescriptions might be given, containing metalic and other salts and emetic substances; but it is unnecessary to enumerate them, as they act on the same principle.

The "sal volatile," recommended by some persons, is not hurtful as to the medicine itself, but inefficient; and "hot water, if given with it, is positively injurious. "Hot brandy and water" is also injurious: as it must be known by every person, medical or not that hot brandy and water is inconsistent with fever-medicines in feverish disease. If the patient does not die in the cold stage, the quantity of brandy in his inside will add to the fever when he arrives at the warm stage; and practitioners who formerly witnessed the cholera will recollect having sometimes seen a patient begin to get warm during such treatment, as if benefited by it; whereas this incipient warmth indicated the commencement of the second stage of the disease, and not relief from the disease, for the patient precisely at that period died, to the disappointment of all around him.*

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* For the purpose of demonstrating the mode of treatment recommended, I may add a couple of cases taken from my note-book; the first having all the marked symptoms of the worst form of cholera from which patients can recover.

March 14th, half-past ten, P. M.—W. H. M., aged 40, had been out attending to business, and rode in an open carriage from about 3 till 5 P. M., in good health and spirits, as remarked by his wife. About 6. P. M. attacked with pains in limbs, back, abdomen, chilliness and coldness of the skin, with frequent vomiting and purging; supposed to have had thirty watery motions up to the present time; the matter passed like rice-water, with white farinaceous-looking sediment; no urine, thirst, but tongue clean, moist, and cool; pulse 110; very feeble, countenance cadaverous, skin livid (blue-black), hands cold, and the skin shrivelled; fingers crooked like a bird's claws, and in pain from cramps in hands, arms, feet, legs, neck, and trunk both back and abdomen; voice shrill, complains chiefly of the cramps, cold, and nausea. Ordered antim. tartaris. two grains, magnesia sulph. half an ounce, in half a pint of water, a table-spoonful to be taken every half hour.

Two, A. M. (three hours from last visit.)—All the symptoms relieved: no sickness, only two more motions of the same appearance; cramps gone from hands and arms, and less in the trunk—still in the legs; hands less cold, does not now feel chilly; began to feel warmer along the back after the second dose, *i. e.* little more than half an hour after commencing the medicine, though the previous efforts of his attendants with hot flannels, bags of hot bran, &c. had not produced the slightest effect, and were laid aside by me on my first arrival.

15th, eleven, A. M.—All the symptoms relieved; pulse full, soft, 76; still rather thirsty, and skin warmer than natural, and dry; tongue clean, rather whitish; has had refreshing sleep within the last hour—none before; feels only weak, no cramps, but pain in muscles on motion; only three motions like the former during the last nine hours, amounting to about two pints; none for the last three or four hours; no urine; slight nausea after the last dose of the medicine—let him take only half a tablespoonful every two hours, and five grains of calomel immediately.

Six, P. M. One yellow, fœtid, feculent motion, and nearly a quarter of a pint of natural urine.

Eleven, P. M. Has had some sound sleep, feels comfortable, but weak; and muscles feel tired, and rather painful after the cramps.

16th, mid-day. Feels well, but weak; pulse 84, full and soft; skin still warmer than natural. Ordered to continue the mixture every four hours, with half a grain of sulphate of quinine each time. The recovery progressed rapidly.

Having alluded to the very slight cases, I may subjoin one. Called at 10 P. M. to a lady. She had been attacked in the morning with a shivering, slight nausea, and diarrhœ; about six watery motions (rice-water and white sediment), unaccompanied by griping, no cramps, but some pain in calves of legs; the shivering continued, and she took a hot bath without any relief; she then went to bed, and could not get warm until after drinking a great many cups of mixed tea (a sedative), when profuse perspiration came on, with relief, in which state she was at my visit. There had been a dry heat before the perspiration, but even then a tendency to

It would be difficult for any person unacquainted with the phenomena of "fever and ague" properly to understand this subject.

Some persons have interdicted vegetables and fruit, a most useful and healthful part of our diet, which physiologists shew, from the formation of our teeth, we were intended to consume, if it were not enough for our guidance that a bounteous Providence has given them to us as a useful admixture with animal food for the preservation of our health. But because some poor creatures, who could not afford better diet, had fed upon "plums and sour beer" previously to being attacked with cholera, "fruits of all kinds, though ripe, and even cooked, and whether dried or preserved," are interdicted, as well as "green vegetables, whether cooked or not." Whereas, on the contrary, good vegetables and ripe fruit, by preserving a healthy state of the blood and secretions, are calculated to give strength to resist an epidemic influence. "Pickles," too, are forbidden, though the antiseptic properties of the vinegar and spices used in their composition are calculated to prevent, not promote, cholera.

Having now stated what is essential as to the practical treatment, I may add a few observations on the theory of the disease.

What is called "the fever," so well known in India, beginning with chills and shivering (rigors), &c., followed by intense heat (after which, in favourable cases, there is perspiration, with relief of symptoms), pursues occasionally a different course; for, as we also see here in common ague, the sweat does not come on, but the skin remains hot, in a state of continued or remittent fever. Who that has seen much of the cholera does not recollect some cases with this routine? Again, "the fever" of India, when it goes through the ague stages, does not, like our agues, continue for weeks; a second, or at most a third paroxysm, is usually fatal in the severe cases which the physician cannot check. Who has not seen patients die in cholera after they had become quite hot, that fever-heat exciting

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shivering; and she remarked that upon stretching out the hand, or even turning the head round, there was a sense of shivering produced (morbid sensibility, independent of temperature). I recommended her merely to drink some more cool tea if thirsty; and, in case of any return of the diarrhœa the following morning, to take a dessert spoonful of the saline antimonial every half hour. It did return, with nausea, and the second dose removed it entirely.

fallacious hopes? There is an epidemic, the "Bombay fever," on record (*see* p. 182), which is said to have destroyed the patients in the cold stage; and it was inferred that, had the patient lived, the hot stage would have come on. Who will decide now whether that was fever, or cholera, or ague, or which is which? for, though called fever, the description agrees with cholera. Whoever has had much experience in ague has seen all the modifications of cholera; the cold stage, with convulsions (spasms)—spasmodic cholera; ague, with nausea and diarrhœa, and of course little or no urine—the purging cholera; ague with livid blueness of the skin, and shrivelled fingers, like a drowned person—blue cholera; ague, passing into continued fever—a common termination of cholera, &c. &c.

One of the most successful modes of treating ague is to give an emetic in the cold stage, followed up of course in the intervals by bark, or other tonics, with calomel, purgatives, &c. *pro re natâ.* I have frequently shewn my clinical pupils that bleeding in the cold stage is perfectly safe, and analogous to an emetic as to efficacy; but as it is not often indispensable, I have not frequently resorted to it, as the emetic answers the purpose; but content myself with bleeding the patient, by leeches or otherwise, when requisite, between the paroxysms. It is pretty well known how valuable an adjunct bleeding has been considered in cases of cholera; but the evidence is complicated, from the variety of treatment which has been adopted in conjunction with the bleeding. There is, however, unquestionable evidence that patients have been raised from a state of collapse by venesection, which we know, by experience, no medicine could have effected, and in which, upon opening a vein, the blood has scarcely oozed forth in a tarry state, but by rubbing down the vein, it has trickled out by degrees, and at last flowed with relief.

It would be quite beyond the limits and scope of this work to enter further into the description of Cholera; but in Dr. James Johnson's *Med. Chirur. Review*, April 1832, will be found ample valuable information on the subject. At p. 627 there is a note by the editor especially worthy of notice, shewing that the gruel or rice-water evacuations which constantly occur are not specific, but merely the result of all the bile and fæces which had been in the intestines being carried away; or, as he says, "ex nihilo nihil fit;" and I may add that, so far from a "discharge of bile completing cure," the discharge of bile is merely the ordinary event, evincing remission of the disease, or convalescence; and a renewed diarrhœal paroxysm of cholera would soon wash that away too. This clear-sighted and experienced physician also inculcates the use of sulphate of quinine, as I have done, on principle.

A large proportion of severe cases of Asiatic cholera, if taken in time, may be cured by acting upon the principle of relieving the internal congestion: unless, indeed, analogous to what takes place sometimes in continued fevers, the individual have received so powerful a dose of the epidemic poison as will certainly prove fatal, despite any mode of treatment. If the blood, however, has begun to coagulate, the patient is dead to all intents and purposes, even whilst breathing and speaking, and the heart acting; for I have heard the sounds of the valves of the heart just before death in cholera, when I am satisfied clots were already forming in the ventricles: at this stage, of course, neither sedatives, stimulants, bleeding, nor any thing else, can produce any effect. The slight or middling cases of cholera have a tendency, like ague, to remit of themselves; hence, whatever treatment had been adopted, the practitioner used to think he had cured them; and thus I have been repeatedly told by practitioners that they had found the right thing to cure the cholera. But the next time I met them, there was a diminution of confidence in the specific. Any person, however, who will treat the disease on principle, may defeat it by a variety of weapons, only using them with energy,—antimony, all kinds of salines, acetate of lead, sulphate of zinc, common salt and water, even cold water,* lemonade,† calomel; but tho last, if used in the quantity necessary to be sedative, may afterwards produce havoc on the mouth.*

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* The uniform desire for cold water in cholera is an example of natural instinct which is thwarted by man, in his wisdom; while every thing hot, both as to caloric and stimulants, is often poured into the patient.

† "*Case by W. G. Maxwell, M D., Calcutta.*—" Previously to the time when I was attacked by cholera, I had for ten years and more been treating it, and trying to cure it in others: but when my own time was come, and I lay prostrate, then did I feel how little I knew of the disease. I had lost my patients under every treatment that I tried; and I had also seen cases recover which I had given up, and placed on litters to be brought to the next halting ground for interment. These would have no covering, but would have the *cold damp air of night* blow on them, and they recovered.

"It was by *chance* that I fixed on citric acid for myself. It was standing among many other bottles on my table in my room, and I fancied it as the very thing I had an *internal longing* for.

We have in some years suffered from another scourge, the influenza, which is somewhat akin to cholera, or rather perhaps is of a mixed nature, between the cholera or ague and Sydenham's "new fever" (synocha petechialis), and which may be rapidily cured by an emetic, followed by saline antimonial medicine, and, as soon as the febrile state is passed, light tonics. I have only to observe on the subject of bleeding in influenza, that it is seldom necessary, except when the epidemic is complicated with internal inflammation of the lungs and bronchial tubes, or other parts (as it has been in many cases); and then the patient will run great risk of dying, if not bled. This I mention particularly, because I have so often heard it asserted, that the influenza does not bear bleeding or "lowering" treatment.†

"I took more than two ounces of the crystallized acid, in copious repeated draughts, which refreshed me and allayed the dreadful thirst; I passed urine, and recovered."—*Medical Times, Dec.* 9, 1848.

This case is the *beau ideal* of empiricism, but I wish to turn it to account as an illustration of the principle of action of a sedative astringent and, by contrast, the inutility of hot applications.

* Dr. Ayres, in his communications in the *Lancet*, November 1848, states that he has not found this to result when he has treated cholera by calomel; and quotes numerous cases in confirmation. This does not agree with the reports of other practitioners, and as we know that salivation occurs occasionally some time after mercurial medicine has been discontinued, I feel it safer to employ antimony, which I have experienced to be equally efficacious, although, as mentioned above, I have also used calomel with it in moderation.

† Of this I may offer one or two examples. A young woman presented herself as an out-patient of the London hospital, with influenza of forty-eight hours' standing, flushed, chilly, headache, pain in chest, soreness of throat. I took the opportunity of shewing the pupils the antiphlogistic treatment of influenza: sent her direct to the clinical wards, had her bled to a pint, and gave the saline antimonial mixture and calomel. This treatment my assistant followed up with the addition of leeches to the chest. She recovered speedily.

Another case is that of a particular friend, who is in the habit of what he calls curing himself—which I translate, taking the wrong medicines, so as to render his case more complicated, before he sends for me. He wrote to me a note during the prevalence of the influenza. "I have been taking * * * * * for two days; nevertheless I am so much worse that you must come and do something decided for me." I found him labouring under an aggravated attack of influenza, flushed, catarrhal, headache, incipient short cough, pain at epigastrium. I took immediately twenty ounces of blood from the arm, and gave him a quarter of a grain of tartar

The benefit of sedative (antiphlogistic) treatment in these cases, and in various fevers, indicates the propriety of using the *sedative* narcotics when an anodyne is required to allay cough or procure sleep during their progress; hence, though many use opium or laudanum, I prefer the preparations of morphia, or hyoscyamus, as has been formerly explained.

We have now to consider some other special diseases. Notwithstanding that rheumatism exists in organs of which, as pointed out by Bichat, the fibrous tissues constitutes the major part, I do not consider that arthritic disease, rheumatism or gout, depends upon a lesion or inflammation of that tissue in particular, as is often supposed. The fibres of the tendons of muscles, the fibrous tissue of ligaments, and cartilage, like the osseous tissue, must not be viewed apart from the connecting areolar tissue and the accompanying nerves and blood-vessels; and we shall be thus led to conclude that, however important they are to the animal economy, by serving as the basis or characteristic material of individual organs, they are second to the highly important areolar tissue and the arteries and nerves in the production of pathological phenomena. By this explanation the student will understand how it happens that the comparatively lowly organised structures, ligaments, fasciæ, articular capsules, &c., precisely like the more highly organised skin and mucous membranes, are so intimately connected pathologically with the general condition of the individual: he will not wonder that indigestion should produce an attack of rheumatism or gout, or that either may be suddenly translated to a vital organ, constituting what is called metastasis, and thus prove rapidly fatal; or that cold and damp, alteration in the electrical states of the atmosphere, should be so keenly perceived, through the occurrence or increase of disease, before even the ordinary senses have been able to apprise the individual of the change; thus making a rheumatic patient, what he is not inaptly called, a living barometer.

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emetic and a drachm of Epsom salts in an ounce of water every two hours. With this treatment, and sundry doses of calomel, rhubarb and magnesia, which he took besides without my directions, he speedily recovered from the influenza, which is said not to bear "lowering" treatment.

The effect of the antimony and salts on cases of influenza, without local inflammation, is to take off the painful chilliness and nausea, exactly as pointed out in the case of cholera related p. 192.

Some persons are led to suppose that rheumatism, being inflammation of the fibrous tissue, as it is called, is something quite peculiar, quite different in its nature from inflammation of other parts. When it is considered, however, that it is the same inflammation which exists in other parts, the same lesion of nerves and blood-vessels, the symptoms being modified in consequence of the nature of the aggregate tissue, the practitioner will be led to rational treatment, according to the principles I have laid down for the treatment of inflammation in any part of the body; in every instance of which, he has not to act for a name, but to reflect upon the proximate cause of the disease under consideration, and the constitutional condition of the patient; for he will have noticed in how many instances of disease bearing the same name he has had to operate with different means, and according to what, in a superficial view of the subject, might be looked upon as opposite principles.

There are forms of chronic rheumatism which it is extremely difficult, if at all possible, to distinguish from neuralgia; so direct is the connexion between the nerves and rheumatic disease. Indeed, I believe that all rheumatism commences with lesion of the nerves of the part: to which it may be objected, that in *acute* rheumatism the other tissues are red and swollen. Even so; the process of inflammation begins by functional, if with no physical derangement in the nerves, and spreads, owing to the diffusion of the nervous tissue, through the skin, muscles, sheaths of tendons, pericardium, &c. This affords an explanation of the phenomena, and of the utility of the remedies employed: many cases are curable by tonics, while most are relievable at all stages by narcotics; some imperatively requiring bleeding, a few injured by it: the perception of which last-mentioned fact was the reason that bleeding was quite out of fashion at Edinburgh when I visited it; so much so, that patients with their wrists and ankles swollen, and the chest oppressed, were not bled, because, as was truly asserted, bleeding *sometimes* caused the convalescence to-be tedious. No doubt this happened when discrimination was not used. All my life I have seen men prescribing for diseases by name: one man bleeds away in acute rheumatism, another never, or scarcely ever; one gives emetics and bark in all cases, another mercury, another colchicum, &c. &c.: one man finds digitalis of great use in rheumatism, another stares at his assertion.

From what has been already said on the subject of inflammation, it may be deduced why and where these remedies suit; why, for example, digitalis and bleeding will procure sleep better than opium when the brain is plethoric and feverish; and, on the other hand, that wine and other products of fermentation will procure sleep better than even opium when there is a state of inanition.

I must beg pardon of my senior readers whilst I set down a few directions for the juniors, in further explanation.

Do not neglect to bleed in acute rheumatism (rheumatic fever), if with a plethoric appearance you have the external redness and tenderness, combined with oppression at the chest, indicating tendency to pericarditis, or if there be symptoms of meningitis.

Do not bleed in acute rheumatism, unless emetics and other treatment have failed, if there be *only external* pain and swelling, and a patient not strong, lest you have a *slow convalescence*, as any one may expect if a patient be bled unnecessarily.

But on the other hand, always have the fear of internal inflammation, "metastasis," in your mind's eye, or you may have *no convalescence* at all, but death for want of bleeding. If your patient gets severe endocarditis or pericarditis, you will either have death soon with fever, as I have known happen from neglect of bleeding, or a lingering death from destroyed valves, adhesion and enlargement of the heart (such as may be seen on the shelves of every museum), with dropsy.

Never neglect, in acute rheumatism, to examine the chest, and inquire about it; for the patient will scarcely ever complain of it, even when affected, in consequence of his attention being drawn off to the severe pain in the limbs and muscles of the trunk. Conviction has been forced upon the medical world, that in rheumatic fever the heart uniformly participates in the disease; though "metastasis" to the heart is not said to have taken place, until symptoms of serious lesion of the organ are evinced; but the peculiar pulse of rheumatic fever declares the state of the organ. It is irritated sympathetically as in other acute diseases, hence the pulse is more frequent; but being itself affected by the rheumatism of its fibro-serous tissue, it is weakened in its action; hence it does not empty itself, causing the full soft pulse,—full, because there is much blood, and soft, because the action is not energetic.

Opiates are useful in almost every case of rheumatism, particularly in order to procure sleep, as sleep restores the nervous system; tonics are beneficial, as already explained, by their influence on the nerves; emetics operate favourably as sedatives, diminishing the action of the heart, without debilitating it (p. 141). And, besides, to relieve the external inflammation, antimony, colchicum, &c., in doses short of producing nausea, when circulated to the capillaries, act like the tonics commonly so called, as already explained. Veratria and the allied alkaloids rubbed on the skin and absorbed, produce an effect directly on the nerves of the part.

In referring rheumatic inflammation to the nerves, I have only gone a step farther than some who call certain kinds of it neuralgia. The exciting cause of rheumatism is usually cold and damp together, not either alone; intense cold will seldom produce rheumatism, if the atmosphere be dry; but if the skin have been perspiring previously, so that it or the inner garment is damp, rheumatism results; warm damp does not produce it. A cold fog or rain will produce the effect, though the person has not been previously perspiring. Moisture appears to exercise a peculiar effect on the electric state of the nerves; but if the parts be warm, that is counteracted,—the cold and damp together are noxiously sedative. Every person can recollect illustrations. The softer and more vascular tissues are not so easily contracted to a noxious degree as the dense fibrous tissue; hence the latter is the first to suffer from the sedative damp and cold.

Gout is, and is generally acknowledged to be, closely allied to rheumatism; either may be brought on by external influences, but much more easily, or by slighter causes, when the system is predisposed, that is, the nervous system.

It is not so generally believed that gout is ever induced by external influences, because the disease is so constitutional, that it recurs on much slighter exciting cause than rheumatism; they are both, in general, essentially connected with indigestion; but, in gout, the indigestion is more often acquired; it is, however, well known that temperate persons have gout, because they have had naturally, whether hereditary or not, a feeble nervous system and weak digestion; and it is a great mistake to suppose that utter abstemiousness will cure gout in such weak habits. Abstemiousness, with exercise and medicine, may restore the digestive organs and cure gout which has been brought on by intemperance in a naturally strong frame ; but abstemiousness will never restore strength to a weak constitution, nor cure what is vulgarly called " poor gout, *i. e.* that which has come on in weak constitutions without excess. Enough has been said to explain why gout has been the *opprobrium medicorum*, and *remediorum ;* medicines can scarcely work miracles on bad constitutions, and persons who have gout in the system, and continue luxurious habits, will of course experience returns of the disease, whatever may be the skill of the physician, or the remedies employed. Gout is inflammation, and the treatment thereof has been fully explained—sedative antiphlogistic, and subsequently tonic, including the best of tonic, relaxation of the mind, with exercise in good air—that is to say, not a London life.

ERYSIPELAS also commences in the nerves. Cold air does not produce the inflammation, unless the part have been previously warm and damp, and then a continued stream of cold air will produce erysipelas. Slight erysipelas of the face or ear is frequently produced in this way, and called by the peasants, a " blight."

When erysipelas is about to appear, the part becomes painful long before there is any redness ;* it begins, in fact, with lesion of the nerves. It is well known that severe pain long precedes any blush or other evidence of inflammation in shingles.

This circumstance of inflammation resulting from cold and damp has been commonly attributed to *checked* perspiration; because it has been thoroughly ascertained, empirically, that perspiration had preceded the injury. But the reason is as I have stated—the perspiration acting merely as adjunct to the cold. In ague, we know that the nervous system is injured by malaria, which is also a well-authenticated cause of rheumatism, which resembles ague in phenomena as well as cause, being often intermittent;* and to carry the analogy to the treatment, there is none more efficacious for either than that of Haygarth for rheumatism—emetics, followed by bark; and the emetics repeated if the symptoms are obstinate. But it will be said that malaria exists in hot climates. I answer, observe how careful Italians and natives of other warm climates are to avoid night-air. Their nights are often piercing cold, and the air deleterious; whereas our night-air is not so. The sedatively poisonous effects of cold and malaria are powerfully increased by their acting together. Pleurisy and peritonitis arise in the same way; and pleurisy, as well as pericarditis, is not so often "metastatis" as has been thought, but an inflammation synchronous with the rheumatism.

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* Some time ago I had an interesting exemplification of this fact, having been called to see a youth with superficial inflammation of the arm, supposed to have been brought on by a liniment. It was erysipelas of that kind which on the waist is called shingles (herpes zoster), exactly portrayed in Willan's plate. The application could not have produced it, as that was a mild soap liniment ; but the interesting fact is, that the severe incipient pain of the erysipelatous disease, commencing on the Monday, was supposed to be rheumatism, and the arm rubbed ; and no redness was perceived till the Wednesday evening, when the liniment was blamed. In this way I have known leeches falsely accused of bringing on erysipelas, having been applied to the temples for the severe pain and heaviness of the head of its incipient stage. It is true that in some individuals with " irritable skin," or in elderly people, the bite of a leech, the prick of a pin, or the bite of a non-poisonous insect, particularly if the injury be where the tegument is lax, may produce a degree of erythematous inflammation, but not genuine erysipelas.

Now, on the other hand, we must be on our guard, as there are cases of apparent neuralgia (neuritis) which are chronic inflammation of serous membranes, and which I have cured by active bleeding and antiphlogistic treatment, as if they had been but a day old, though they had existed for many months. Those that I have seen have occurred chiefly in the meninges of the brain, or in the pleura or pericardium. How are they distinguishable from neuralgia? By the accompanying obscure pyrexia, malaise, altered temper and appetite, frequent pulse, and generally bad sleep (p. 185, note).

I may in this place bring forward some further exemplifications of the principles of applying remedies. Without referring to what has been said upon delirium tremens (p. 164 et seq.) it would be difficult to understand how, in some cases, genuine narcotic or hypnotic medicines fail of procuring sleep. I have before mentioned (pp. 104, 171,) that when digitalis, a sedative, is indicated, it acts as a soporific, whereas opium in that case would fail; sometimes, on the other hand, when fully indicated, a stimulant will procure sleep.

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* Macculloch's work on this subject is very interesting and instructive ("Essay on Remittent and Intermittent Diseases. 1828").

Thus, in a case of subacute rheumatism (recent severe sciatica), extending down the leg, with pain on pressure, the *secundum artem* treatment, by colchicum, calomel, and low diet, did not relieve. Moreover, morphia did not procure rest; for the night before that on which I was consulted, it had been tried in a full dose, and failed. I found the patient's pulse frequent, but moderate as to strength; the fauces relaxed, and the tonsils swollen and rather purple, shewing a debilitated constitution. I ordered bark and soda, instead of the medicines previously used, and some wine at dinner; and instead of the morphia, half a pint of good ale at bedtime. The patient slept well; and the next morning the tonsils were of a good, that is, an arterial, colour, and less swollen. The rheumatic pains were much relieved within thirty hours after the change of treatment. Such cases may be considered the triumph of principle: both the rheumatism and sore throat, as inflammatory diseases, were considered to require antiphlogistic remedies, with which morphia was consistent; but the inflammations being accompanied with debility, stimulants proved *antiphlogistic*, and therefore procured sleep (p. 98). It may be said that this was a case of rheumatism of the sciatic nerve, curable, on Haygarth's plan, by bark. Be it so: but the practice adopted was unique (and deduced *à priori* from the principles I have laid down),—to give wine and ale to cure inflammation, which was evinced by pain on motion and pressure, frequent pulse, restlessness, and a recent sore throat in addition; but the pulse was not hard, the tongue was not foul, and the skin was not dry. I trust the student will learn to prescribe on principle, and not empirically apply a nostrum to a disease because it has a name. If diseases could be so labelled, the practice of physic would be as easy as some young gentlemen, judging from the little attention they pay to the opportunities afforded them in the hospitals, seem to think, but which they bitterly regret in after-life, when they incur the responsibilities of practice.

I would contrast with the last-mentioned case one in which a sedative was required, followed up by the same tonic treatment of bark.

An old friend and pupil asked me to visit his child, about which he was very anxious, it being much sunk from a large suppurating tumour of the submaxillary gland, from which there was an erysipelatous inflammation spreading across the lower part of the face. The application of leeches the day before had not checked, but, by increasing the debility seemed rather to augment the malady, as the inflammation was spreading. In this case, tonics were absolutely necessary to give power to the capillary arteries (to increase their action); but we could not wait for the slow operation of tonics (pp. 87, 98 et seq.), as the erysipelas would have spread; I therefore gave an emetic, and requested the parents to watch how its action would produce a paleness in the then increasing boundary of inflammation. The emetic did stop the inflammation without debilitating; and the tonics, with nourishment, prevented the renewal of it; so that there was only the trouble of the tumour remaining, which had suppurated before I saw it. Some calomel was also given, as part of the tonic plan, to act on the capillaries, not as a purgative—the child having been well purged before.

It may be asked why I made the distinction in this case, and gave a sedative instead of a stimulant, as in the preceding. The former was neuralgia of the sciatic nerve, and not likely to be augmented by an increase of the force of the heart, especially if sleep could be procured, which was our object; the inflammation of the throat was of the livid kind, called passive, the pulse moderate, so that the state of the nerves was more to be considered than the *vis à tergo* (p. 102). The second was not neuralgic, but inflammatory—relaxation of capillaries evident to the eye, which the *vis à tergo* would have increased, as may be deduced from the instant good effect of taking it off by lowering the pulse by the sedative (emetic); and this shews the great value of emetics as a substitute for bleeding in cases where bleeding would be required if it could be borne; and also how powerfully emetics must assist bleeding, where they would not be sufficient without it.

Here, in two words, is the epitome of the treatment of erysipelas—emetics and tonics. Tartar emetic, to check the inflammation, which being of asthenic character, is benefitted by leeching or bleeding at the moment; nevertheless much evacuation will even increase the tendency of the disease to return, as is known by experience. Quinine and other tonics, including calomel, take away that tendency or disposition of the disease to return; and the latter, by its tonic effect on the liver, promotes the digestion, and consequently the strength of the patient, who must be well nourished after the paroxysm. Practitioners well know that it is in the nature of erysipelas to return from time to time like gout, or even more frequently, and thus undermine the constitution. I can assure them from experience that the plan I have laid down, persevered in, and modified according to circumstances, will eradicate it.

I must here repeat a caution against being deceived by symptoms arising during the administration of a remedy (tonic, for instance), which are frequently ascribed to it, though not really depending upon it. It is often observed that after a person, especially a child, has taken a purgative on account of indigestion or acidity, the patient becomes even hotter, before the bowels are relieved; but this is merely the effect of the transit of the acrid matter through the intestines, equivalent to that heat and flush which is produced by the acidity of indigestion in children, which commonly relieves itself by vomiting. In some cases of debility, especially in convalescence from acute diseases, as measles, scarlatina, &c., quinine or other tonics are absolutely necessary to prevent occurrence of a strumous state; but as heat of skin constantly supervenes in these cases from weakness of the digestive system, it requires the confidence of practical experience to persevere with the tonic (thought by some to be "heating"), which will strengthen the feeble organs, and prevent the recurrence of the heat.*

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* I must trespass on the reader's patience now to give an example, on the other hand, of the failure of empirical practice, which is so common. Several years ago, one of my pupils, just before commencing practice, called on me to examine his chest with the stethoscope. He thought he had hypertrophy of the heart, from constant, annoying, forcible palpitation. On inquiry, I found that he had pain after eating without acidity; and sluggish bowels, without deficiency of bile. "You have been over-anxious about your examinations," said I, "and have got atonic indigestion." "So I thought at first," he replied; "but as I have tried *every thing* for that, and lived very regularly and sparingly, and taken no fermented liquor, I begin to fear hypertrophy." My prescription was, "Go home, eat and drink, and take half a wine-glass of vinum ferri three times a day, and no purgatives; and when you come again this day week I will examine your chest." He called on me in a week to say he was well, and laughed when I asked him if I should examine his heart.

STRUMA, or scrofula, is a disease of cold and damp climates; it is not in the first instance an inflammatory state, but a morbid deposition in the follicular and lymphatic structures, depending on debility, and these depositions cause obstructions, which, acting like foreign substances, become secondarily the cause of inflammation.

The treatment consists in suitable diet, air, and exercise, to promote the strength; the diet should be of the most nutritive quality, and especially animal food, with wine and fermented liquors. The medicines which have always been found most useful are tonics; but the alkalies have a peculiarly beneficial effect combined with the tonics. This has been attributed to their tendency to act as solvents of the deposits; the tonics are those which we have already discussed. To promote the reduction of the tumid glands and other swellings, iodine is considered preferable to mercury, and it does act more quickly and does not salivate; but before it was introduced into practice, mercury was used, with the other means mentioned above, with great success; not given so as to affect the mouth, but every second or third day, so as to promote the secretions and act on the capillaries. The old medicines for scrofula were bark and natron (subcarbonate of soda), and what were denominated alterative doses of calomel with rhubarb.

As just stated, iodine is now pretty generally preferred to mercury, but though it does not salivate, it is a more debilitating medicine if given incautiously, though, of course, a strengthening medicine if used judiciously. Cod-liver oil has considerable influence in this disease, it acts beneficially on the primæ viæ and on the skin by sympathy, and it also affords a considerable nutriment. One caution is especially necessary in scrofulous disease, not to resort to any active antiphlogistic means for the inflammation of tumours, &c. which occur, lest the constitution be debilitated and the strumous diathesis thereby increased. Strumous swellings ought not to be rubbed, but

Now comes the empiricism. After some three years he consulted me about one of his patients, who had "symptoms exactly like his own, but the vinum ferri did no good." "You have not yet mentioned the sex." "A young lady." "Is she very pale, then?" "Quite the contrary," &c. "Have you forgotten our clinical wards?" "Oh, I suppose you would recommend a drachm of cubebs three times a day, and a grain of calomel about twice a week." To which I assented. He called on me in about a month to let me know that, by persevering in those remedies, the action of the heart was become as "regular as a pendulum."

covered with some mild plaister on thin leather; or if iodine, &c. be applied, it should be without friction, which irritates those tumours; and when they suppurate, they ought not to be opened artificially, if that can be avoided, as the smallest puncture of a lancet leaves a permanent mark, and a large hole which the natural process makes will close up so as not to leave a perceptible mark in general bigger than a pin-hole.

We have now to inquire into the nature of DROPSY, which is an undue deposition of watery (serous, sometimes fibrinous) fluid by those capillary vessels of the serous membranes and of the areolar tissue which, in a healthy state, supply merely sufficient to keep those parts moist. Dropsy is inflammation ("leucophlegmasia"), or congestion (p. 42): the proximate cause of the acute or chronic being the same—a weakness, and consequently giving way or enlargement of the capillaries concerned.

I cannot agree with those authors who consider congestion to exist only in the veins, and to differ from inflammation in the cause being mechanical. We know that a mechanical obstruction in the circle of the blood must cause congestion as surely as damming a river- stream, and that not solely in the veins; but there are causes of dropsy which do not act mechanically, and mechanical causes which produce venous congestion for a long time without dropsy resulting; as it is not until the capillaries themselves are congested, in consequence of relaxation from loss of nervous energy, that dropsical effusion commences, which occurs often when there is no mechanical obstruction—as in acute anasarca from cold, which is inflammatory, as its name implies, and which occurs often in robust persons, like *acute* hydrothorax (sometimes misnamed empyema), from pleurisy; or acute ascites, from peritonitis; or in chronic anasarca, *chronic* hydrothorax, &c. from chronic uterine and other affections in the young or old, or even from a bad compound fracture of a limb.

I hold relaxation of capillaries to be sufficient for the explanation of the phenomena of dropsy; and in like manner as I denied arterial action to be increased in inflammation, so I deny that it is necessary to refer, as many do, to a diminished action in the absorbents as a cause of dropsy. I consider the action of the absorbents to be uniform, and that it is not necessary to suppose any alteration as to absorption as a cause either of inducing or removing dropsical effusion; for, considering the action of the absorbents to be uniform, merely to take up and carry off what is offered to them, it is evident that in case of too great a quantity of fluid being poured out, the absorbents will not be equal to the taking it up fast enough; but when we act upon the capillaries, so as to check their exhalations, we know that the absorbents, continuing their action, will gradually carry off the overplus of effused fluid; and we know that we can restrain the effusion from capillaries in two ways, either by constringing them, or by allowing less fluid to go to them. But of the absorbents we know no demonstrable mode of *directly* altering the action.*

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* Indeed, the only mode in which we undoubtedly affect the action of the absorbent—and that is *indirectly*—is evinced by some of the phenomena succeeding the experiment of the introduction of a poison by incision or injection into the cellular tissue, or serous sacs of an animal, or even into the stomach. It has been noticed that an increase or diminution of the plethoric state of the animal affects the rapidity with which the poison is absorbed, or produces its poisonous effects. Thus, if it be bled after the administration of a poison in either of the above-mentioned modes, poisonous effects will be evinced earlier than in another animal which has not been bled. On the contrary, injection of warm water (98° Fahr.) into the veins of the animal under such circumstances retards the operation of the poison. In opposition to the opinion that, in such experiments, the rapid operation of the poison arises from absorption being in any way accelerated, it might be stated, that by depletion the animal is weakened, and that consequently a smaller quantity of the poison then suffices to produce the pernicious results. But it can hardly be maintained that that explanation will apply to the well-known fact of persons who do not labour under disease, but have been bled whilst in health as a preventive (in former times so much in vogue), the absorption of chyle being so greatly increased, that their robust, plethoric state becomes augmented, and fat accumulates in most parts of their frame. It certainly appears that the function of absorption, or that phenomenon evinced in the living body which out of it is called endosmose, is according to physical laws, modified by the nature and quantity of the fluid contained in the system of hydraulic tubes—the elastic arteries and capillaries, and the veins,—the diminution of whose contents facilitates the emptying of the absorbents into them, and, of course, quickens the flow in the absorbent; in other words, increases absorption. This increased activity of the absorbents, through the depletion of the blood-vessels, is an admirable adaptation of structure and function of parts of the living body to the intended end. How wise a provision for the more speedy reparation of accidental loss of the fluid parts of the machine!

The knowledge of these facts suggests the immediate utility of depleting remedies—venesection, salines, antimonials, purgatives, elaterium, &c. even in dropsies not ostensibly inflammatory; hence the utility of depleting remedies combined with tonics, and the reason why, in cases of poisoning in the human subject, no depletion should be resorted to for checking the inflammation of the viscera until the whole of the poison has been voided or extracted from the stomach.

I believe, therefore, that the *medicines* which are commonly *said* to *increase the action* of the *absorbents* act on the *capillary* vessels so as to check their deposition; and that this is the true account of the removal of dropsical swellings by the action of mercury and other medicines, which either cause an alteration in the action of the capillaries, so as to stop their depositions, or, as elaterium,* for instance, by causing evacuation, actually diminish the quantity of matter supplied by the arteries to the exhalants, whilst the evacuation increases the current in the absorbents.

Dropsy is most frequently not a primary disease, but a symptom—a state of debility of the nervous system, and consequently of the capillaries, induced by disease of some organ, and increased, as in organic disease of the heart, liver, lungs, &c., by mechanical obstruction of the circulation. The partial sudden effusions which sometimes take place from inflammation of a serous membrane, as from the pleura, constituting the empyema of Laennec† (which, as above observed, is not the empyema of Cullen), should rather be called inflammatory effusion than dropsy.

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* It is surprising how many medical men are afraid to use elaterium: having perhaps in early life ascertained that its effects are great, they think they are violent, which, however, is incorrect, *if it be judiciously administered.* If the eye be made to weep by an actual injury, such as sand, or a blow, or other cause of inflammation, the effect is very different from the weeping produced by holding an onion before it. The analogy is perfect between the operations of these two substances: the elaterium produces a weeping from the exhalants of the bowels, which carries off dropsical fluid without the slightest injury to the membrane of the intestinal canal. It is just as erroneous to fear employing elaterium to relieve the chest and other parts of a patient who is oppressed and suffocating with dropsy, as to fancy that a water-logged, leaky ship could not bear the action of the pumps which draw the water from its hold. Some of my medical friends into whose hands this will come have seen the effects of elaterium in saving a sinking vessel. It is to dropsical cases that elaterium is peculiarly applicable, and not in those where merely purgatives are indicated; in fact, *if elaterium be continued as a purgative after the dropsy has been removed, it begins to distress the patient, who, up to that time, felt decided relief from it.*

† I take this opportunity of acknowledging our obligations to Laennec: any man who practised for some years (as I did) before the introduction of auscultation, and felt the difficulty of diagnosis in many diseases of the heart and lungs, can estimate the blessings it confers, by enabling us to distinguish the varieties of these affections. Compared with what we now know of diseases of the viscera in the chest, the degree of information attained five and twenty years ago was but "darkness visible." It appears ungenerous to detract from Laennec by saying he has not assisted us much in prescribing: he has done every thing in helping us to distinguish the disease—the application of remedies depends upon our own skill afterwards. As for any objection to auscultation, I have never known any one who understands it who is not glad to avail himself of it.

Dropsy may be induced by any protracted disease, which, by morbid sensibility or slow fever, robs the secretory organs of their nervous energy, as the kidneys, skin, and intestines, but particularly the kidneys and skin. And when they cease to secrete, the redundant fluid oozes from the capillaries, which are not merely overloaded, but weakened in consequence of the deteriorated state of the nervous system; and unless we can restore energy to the nervous system, so as to check exudation, by giving tone to the capillaries, we in vain resort to tapping, or diuretics or cathartics, such as elaterium, to evacuate the dropsical fluid, as it will speedily re-accumulate.

Thus dropsy is not to be treated as an isolated or single disease, except when, for a time, to prevent a pationt from being overwhelmed by the fluid in the cavities, we turn our whole attention to getting rid of it, either by tapping or by profuse evacuation, as by hydragogue purgatives or diuretics, and other medicines.

When we see a patient with dropsical swellings, our great object must be to cure the disease which produced the dropsy—the latter being but a symptom.

It is true that both are sometimes cured by attending to the one symptom alone, as when dropsy is the consequence of inflammatory disease of the lungs, pericardium, or liver; in which, besides bleeding, squills and digitalis are employed as diuretics, with purgatives to evacuate the fluid by the kidneys and bowels, some form of mercury being at the same time used empirically. Here, although the whole attention be given to the symptom of dropsy, the treatment is also applicable to the local affection; and in such a case the primary and secondary disease are often cured together. By referring to local inflammation as the origin of some dropsies, we can understand how, in many cases, the abstraction of blood becomes a most useful assistant in the cure, as well as the advantage of bloodletting for the mere object of taking off the injecting force of the heart, when the heart and capillaries do not balance in power; as, for instance, when other diuretics fail, from the congested state of the kidneys, venesection often proves the most powerful diuretic, as we have mentioned that it is sometimes a most efficient adjunct to cathartics.

On the other hand, in dropsy of broken-down constitutions, as well as in inflammations with failure of the vital powers, by referring to the influence of the nervous system in giving strength to the capillaries, so as to enable them to contract, and resist the distending fôrce of the heart, we can understand how tonics, and, in some instances, stimulants, as wine, acting as tonics, as above explained (p. 98), increase capillary action, and restrain the effusion, when evacuation would sink the patient; so that dropsy, like inflammation, is cured by opposite treatment, according to the state of the constitution.

A fruitful source of dropsy is disease of the heart—organic alteration, especially hypertrophy, and imperfect valves or contracted openings, the effect of the hard pulse from hypertrophy being to cause over-distension, at the same time that the capillaries, from diminished nervous energy, are weakened; for the obstruction or regurgitation from imperfect valves causes pulmonary congestion, and consequently deficient arterialisation of blood, as well as cerebral congestion, both diminishing the generation of the nervous energy; from which result capillary congestion (evinced by dyspnœa, livid lips, &c.), tendency to coma, diminished secretions, dropsical effusions.

In those cases where the cause is an organic alteration which cannot be removed, we must be cautious in not endeavouring to do too much at once by over-active treatment, as the strength must be supported, though depletion be necessary. Whatever increases the action of the heart, by adding to congestion, diminishes the vital powers; so that there must be a constant exercise of skill to preserve a balance between heart and capillaries. Digitalis, hydrocianic acid, &c. (see p. 105), will restrain the former, whilst the latter will be much assisted by the tonic medicines which do not stimulate, and at the same time help to support the strength under the operation of the occasionally required evacuants and sedatives.

This leads us to the *rationale* of another symptom—HÆMORRHAGE from the mucous membranes,* which, as well as purpura and p. hæmorrhagica, takes place under the same circumstances as dropsy—the exhalants, from atony, and sometimes from over-repletion, as in epistaxis, allowing blood to exude instead of aqueous fluid; and even the capillary exhalants of the serous membranes sometimes allow blood to escape, which we find mixed with the dropsical lymph upon tapping, or after death. Enough has been said to account for the exhalants of mucous membranes becoming so debilitated as to allow blood to weep from them. It used to be commonly said, and is still thought by many, that when blood is vomited, or passed downwards, or coughed up, that there has been a rupture of a blood-vessel; but though this does sometimes happen, the most common source of the blood is from the network of capillaries.

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* "Hæmorrhages" are represented in the systems of some nosologists as a distinct class of diseases. I have endeavoured at once to acquaint the student with their true nature, and thus assist him in the diagnosis and treatment of disease.

In amenorrhœa, the (chronic) hysteritis from which it proceeds produces sympathetic morbid sensibility of the stomach (occasionally of the bronchi, &c., p. 109); consequently relaxation and congestion of the mucous membrane, ending in hæmorrhage, sympathetic vomiting of blood, sometimes periodical (catamenia vicaria). Chronic hepatitis, the local inflammation or congestion of the intestines in fever, and other affections, also bring blood from the surface of the primæ viæ. Bronchitis causes spitting of blood, sometimes tolerably copious, without rupture of vessel. Now in all these cases the symptoms of hæmorrhage must be combated as dropsy, according to the state of the constitution: hence the distinction of active and passive hæmorrhages. The active must be treated by antiphlogistic means,—bleeding and sedatives; the passive hæmorrhages, such as those at the close of fever, and many cases of menorrhagia, most directly and safely by opiates, with astringents, of course, in both cases. And even after active hæmorrhages are subdued, the patient must not be kept too low, as some strength is required to produce the reparation of capillaries which have been injured, when there has really been inflammation. But I have shewn (pp. 161, 171) the nature of cases which constantly occur, in which there is no disease but morbid sensibility, and in which the depletion and deprivation of food, adopted through mistaking the symptoms for inflammation, have sometimes brought the patients to death's door, if not over the threshold; and even if they escape with their lives,

The hæmorrhages, like dropsies, are but symptoms of organic disease, sometimes of the part whence the blood comes, at other times of remote organs.

they may suffer years of debility and discomfort before the stomach can again properly bear the presence of food, or the nervous system recover its tone. How often has it occurred to me to be called in by young medical men in breathless haste, who were really in a state of great anxiety about a patient, generally a female, sometimes after parturition, in one of those "mimose" affections just alluded to, resembling inflammation, apprehending the greatest danger; when instantly, on looking in the patient's face, and feeling the skin, I have whispered, "There is nothing the matter with her." "But what is to be done?" "Nothing." "But she will die, if she goes on this way." "Not if you abstain from active treatment."

The inflammation or relaxation, producing increase of secretion from mucous follicles in different parts lined with mucous membrane, denominated CATARRHS, may be combined with fever or not: as in catarrh of the air-passages, diarrhœa, or acute dysentery; hence relievable either by stimulants with opium, on the one hand, or by sedative treatment (including bleeding) and opium, on the other. If you ascertain that there is not fever, you may stop simple troublesome catarrh (p. 99 et seq.) or diarrhœa, by stimulants or opium with astringents, either in recent or chronic cases, as in chronic dysentery also; but if there be active inflammation and pyrexia, as in bronchitis, influenza, and acute dysentery; an antiphlogistic (sedative) treatment must be adopted with the anodyne.

The terebinthinate gum-resins, and balsams, tinct. benzoes co., cubebs, &c., which have been found useful in the catarrhal states of the urethra and vagina, have the best effect also in catarrh of the bronchial tubes, and none more so than Venice or common turpentine, the efficacy of which is increased by combining it with powdered senega-root in pills. The senega has as much influence on the capillaries when circulated to them as ipecacuanha; and as it is less emetic, it can be given in larger quantity.

Whooping cough is a complication of catarrhal or bronchitic inflammation with fever, very analogous to the exanthemata, and also allied to the neuroses by the state of the nervous system, and requiring frequent alternations of treatment, sometimes antiphlogistic and antifebrile, and at other times almost entirely tonic. The quick relief of the cough by antimony or ipecacuan, when the febrile state predominates, is very marked, as well as the influence which quinine, sulphate of zinc, and other tonics, have over the cough when the febrile symptoms have quite subsided. The acknowledged beneficial effect of change of air on pertussis is referrible to its tonic influence on the nerves.

The term catarrh, acute or chronic, is so peculiarly applied to cough, from whatever cause it may arise, that I think it necessary to make some observations on the nature and treatment of coughs. Independently of recent cases of inflammation in the chest, as cough is a symptom of consumption (tubercular disease of the lungs, to which the term consumption is properly restricted), it always produces, when long-continued, an anxiety in the minds of friends; but cough may arise from a variety of causes which only medical men can ascertain, and which even some of them often fail to distinguish, from not having paid sufficient attention to auscultation; besides which, young practitioners are often not aware of the variety of circumstances which may produce a long-continued cough. I have been consulted for severe coughs of some duration, in more than one instance, which I discovered to depend upon a cause at first sight insignificant, as a chronic inflammation, with hardened wax, in the ear; and though most persons are acquainted with the fact, that irritating the internal part of the ear will produce coughing, these cases had passed through the hands of several medical men without this cause having been detected, although a degree of deafness existed, which attracted my attention to it. Chronic enlargement of the tonsils, and accumulation of a white curdy matter in their ducts, will produce cough; and a relaxed elongated uvula, it is commonly known, induces a most distressing continued cough: and in all these coughs, when long continued, the membrane of the larynx and trachea, inflamed by mechanical irritation, gives out extra mucus, thus producing expectoration, with occasionally even streaks of blood.

Such cases occur both in males and females, giving rise to suspicion of consumption; but a common cause in females is hysteria, often so slight that scarcely any, if any, discoverable irregularity or derangement of the functions of the uterus is evident, and yet the sympathetic morbid sensibility of the bronchia and larynx (p. 109) resulting thence, produces cough, with alarming symptoms, not merely expectoration, as in the cases just alluded to, and which is chiefly from the continued mechanical irritation of the cough, but also spitting of blood, the occurrence of which gives additional cause of apprehension of consumption. The mode of treatment of the former cases is obvious to all medical men as soon as the cause is discovered, according to the old adage; and, as to the latter, I have found no dfficulty in curing the imagined consumption by directly attacking the primary disease* with such remedies as turpentine, iron, cubebs, aloes, quinine, assafœtida, &c.; and anodynes, with squills, &c., to allay the morbid sensibility of the bronchia and larynx; at the same time supporting the strength by animal food and fermented liquors, which are too often forbidden, from the practitioner supposing the symptoms to depend on inflammation, instead of attributing them to the true cause, morbid sensibility; and on that account, not only resorting to low diet and antiphlogistic medicines, but also to frequent bleeding by leeches or otherwise, which makes the patient more hysterical, and increases morbid sensibility.

I have seen a young female who had been reduced by diet and medicines, including salivation, for a cough and loss of voice, which was attributed by several practitioners, some of them of note, to chronic laryngitis, but which was nothing more than what I call an hysterical cough, and which gave way to tonic medicines and a generous diet, with exercise in the open air—the patient having been unnecessarily shut up for nearly two years from the air and light of heaven and human society. There is no more common error than that of excluding the air from patients who have that kind of cough called spasmodic asthma, especially those cases which depend on chronic (Laennec's dry) catarrh, and which I find are curable much more quickly provided the patient be sent out to take exercise in the open air, even in winter. The lungs are calculated by nature to admit cold air without irritation, but not over-heated air after being out in the cold: the most frequent cause of catarrh in winter is going to the fire and breathing hot air after having been out; the prejudicial effect of which is exactly analogous to that of putting the hands to the fire after being out in the cold, which produces chilblain (p. 72); the same thing occasions a degree of chilblain in the fauces or larynx. The cold air is wrongfully accused, and the patient prevented from going into the cool air again, which would have relieved the symptoms.

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* The diseases of the liver not being so readily cured, the secondary liver-coughs or asthmas, do not so quickly yield. Before the publication of Laennéc, it was much more common for practitioners to be guided by obvious symptoms, and prescribe for them. Hepatic disease, as is well known, produces cough; this is dry at first, but in time the irritation of the bronchia produces expectoration; and then, if the liver-disease be accompanied by hectic, as is commonly the case, I have known it mistaken for phthisis. In other cases, the indurated enlarged liver produces pain in the back, and sudden starting up, and difficulty of breathing, after the patient has been some time asleep, in the middle of the night, when dry cough, which subsides after the patient has been sitting up for some time. I have been called in to cases of this kind where the patients were dying of diseased liver, with more or less dropsical swelling, who were said to be asthmatic. On the other hand, I have been consulted concerning patients sinking under dropsy from diseased heart, which was attributed to diseased liver; an error more readily committed, in one instance, as the patient had returned with these symptoms from India. In all these cases auscultation was of the most valuable assistance in furnishing both positive and negative information.

A medical friend of mine had a continued troublesome cough, causing anxiety on the question of consumption, and consulted me; amongst other points, upon the necessity of using a close carriage instead of his cabriolet. I cured him by merely advising him to turn his back to the fire whenever he went into a patient's room, which was very frequently the case, he being in extensive practice; and by recommending a more generous diet, as he had been living rather low through the fear of inflammation.

On the other hand, the following case will shew the value of auscultation where there was serious disease existing, requiring active treatment. I was consulted by a patient who had been ill about two months; he had all the nosological symptoms of advanced consumption,—cough, expectoration yellowish-white with a little blood, night-sweats, emaciation, some pain in the side on deep inspiration, &c. Thanks to Laennec, I was able to discover immediately that it was not consumption, but hectic fever from neglected peripneumony; and, notwithstanding the debility, I adopted pretty active treatment—free leeching of the side, and saline antimonial medicine, with milk and vegetable diet, which soon cured him.*

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* A gentleman engaged in an active business had been for many months affected occasionally with symptoms resembling what is called angina pectoris, a difficulty of breathing, or rather sense of distension in the chest, causing him to stop suddenly, from a feeling of distress and sometimes pain, and making him, when it at-

Those cases called spasmodic asthma, which in reality depend on chronic catarrh, may be cured by tonic medicines combined with palliating expectorants; but this will not succeed unless the patients, instead of being dieted and confined to the house, have every means taken, by animal food, fermented liquors, and exercise in the open air, to put them "in condition."

I may here remark, that I totally disbelieve in the existence of spasmodic asthma as a disease of the muscular structure of the bronchial tubes (see Adv. 2d edit. p. xvii.). I have never seen a case which, sooner or later, could not be traced to organic disease of some viscus, as the heart, liver, spinal cord, or lungs themselves; such as emphysema, Laennec's chronic dry catarrh, &c. &c. Some of these latter cases, occurring in young or old persons, are curable; many of those depending on organic disease of the heart in old persons can, of course, only be palliated.

To return to the subject of the effect of the atmosphere on the lungs. The advantage of breathing warm air is very much overrated. We uniformly see that real consumption (tubercular) runs its course rapidly in Italy, or any warmer climate; such, at least, is the result of my observation.* A deception has arisen in consequence of persons not really consumptive, but affected with severe

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tacked him in a sitting posture, get up and walk about, from a painful restlessness. He had only occasionally a slight cough, looked well and florid, but was getting irritable and anxious, and could not sleep, from uneasiness in the region of the heart, which was increased by a deep inspiration, or by sneezing. The pulse ranged from 84 to 100, firm, rather hard; the tongue pale; he had no feverish languor; and notwithstanding the above symptoms, and that he could not stoop to lift any thing from the floor without pain, he felt well and strong, he said, if it had not been for the bleeding, purging, and other antiphlogistic treatment most judiciously adopted by his medical attendant, who called me in to enforce compliance by his patient, who was a near relation, and was rather surprised at my inculcating more "drenching," and a number of leeches to be applied at intervals of forty-eight hours for a week. This case was one of "latent" pleuro peripneumony of the left lung (there was ronchus crepitans, bronchophony, &c.), which had continued in a chronic state from an acute attack six or eight months before: he was soon relieved by the active antiphlogistic treatment. These cases occur not unfrequently in hospital-practice, in artisans who have returned to their work too soon after acute attacks; and are almost always cured by bleeding and sedatives, calomel, &c.; often even after extensive dropsical symptoms have set in.

* I am confirmed in this opinion by the experience of Andral.

chronic catarrh, or bronchitis with expectoration,* having been sent into warm climates, who, from the comparatively trifling nature of this disease, have returned cured, or at least benefited. In some of these cases, erroneously called phthisis, the progress of the disease is said to have been checked by the influence of the milder climate. This popular prejudice has still, however, a strong hold on the minds of men, and even auscultation has not yet corrected it.

It is generally very unnecessary, and worse than useless, to send patients away from their friends, and often at an enormous inconvenience. If they are consumptive, they will thus die in exile; and if not, they may be cured at home. Of the first it is unnecessary to give examples—there are abundant marble records in the neighbourhood of Leghorn, in the West Indies, and Madeira, &c. A case will explain more fully what I mean by the second. A young gentleman was condemned by high medical authority to banishment to Madeira, as "nothing else could save him;" but to this some strong objections existed. The first was love—he was on the point of being married; the second, his engagements in a valuable business, which depended much on his personal superintendence: a reconsideration of his case was therefore moved for, and my opinion requested. I decided that it was mere chronic catarrh in a relaxed constitution; that some tonic, such as iron or bark, with animal food and fermented liquor, was alone necessary; but, above all, exercise on horseback in the *cool* open air. Under this treatment he recovered within a month, and is now the father of a family.

The case of another patient, who, after having been sent to the West Indies for incipient consumption, as it was called, had returned in good health, was triumphantly adduced to me as opposed to my opinion (as the last-mentioned case would have been, had the patient exiled himself as at first recommended). On the following January, however, I was again consulted, in consequence, as it was said, of the consumptive symptoms having returned. I found the patient shut up in a warm room, dieted and physicked, and waiting for a vessel, intending to sail again to a warm climate, at a great inconvenience as to family affairs, &c. I prescribed the same remedies as in the former case, and insisted upon walking exercise in the open air being commenced, even at that time of year. The patient was free from cough in about ten days, and has so continued ten or twelve years. I must observe, that auscultation alone did not decide me in either of these cases: they had both been previously seen by practised auscultators. Though a warm advocate for auscultation, I am aware that, besides the injurious and absurd affectation of some who are really practically ignorant of it pretending to understand its employment, there are others who place too much reliance on it for diagnosis, omitting the consideration of the collateral constitutional symptoms.* This is nearly as absurd as a Pasha requiring an

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* Had really tubercular disease reached this stage of symptoms, it would have been too late.

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* I have found more persons misled by impulsion of the heart than any other stethoscopic investigation. In many cases of phthisis I have been referred to, in consequence of the apparent hypertrophy of the heart, which depended merely upon the increased perceptibility of the heart's action (somewhat increased in reality by the progress of the disease) from the excessive thinness of the parietes of the chest. There are patients who have fits of palpitation of the heart from dyspepsia, &c., during which the impulsion is so great that it would mislead the practitioner, if he have not opportunity of ascertaining, that for weeks, during the intervals of the attacks, the action of the heart will be perfectly normal. (See p. 45, note.)

An hysteric constitution in females and nervous in males will produce impulsion sufficient to deceive the practitioner in many instances, if, as is often done, the patient merely be shewn to him once for an opinion; and medical men ought to be cautious of committing themselves. The best way of explaining this will be by a few examples.

A young lady, æt. fifteen, in a distant part of the kingdom, became affected with cough, violent action of the heart, and subsequently dropsical swellings. The physicians who saw her considered her the subject of disease of the heart, and sent her up to head-quarters, London, for further advice. She was *shewn* to two highly talented physicians separately, who each confirmed the opinion, and gave little or no hopes of her recovery. Her ordinary medical attendant called me in to see her. I found her with short breath, short cough, emaciated and dropsical, even in the upper extremities and face. There was very strong impulsion of the heart; but I could not trace any acute rheumatism or other of the usual sources of hypertrophy of the heart at such an early age, and therefore discarded the idea, and set down the case as one of hysterical palpitation, with dropsy from debility; and prescribed tonics, such as chalybeates and quinine, in small quantities, so as not to oppress the stomach, a generous diet, and an immediate resort to exercise, gestation in the open air. Upon this plan she rapidly recovered, and has continued healthy for some years.

A married lady was brought to me, not to ascertain the nature of her complaint, but to try if I could suggest any relief or remedy for hypertrophy of the heart, which another physician had declared it to be, but had not alleviated her symptoms. I ascertained, in the first instance, that she had been about a dozen years married, without having had any children; she suffered from headaches, tormina, constipation, and other symptoms of hysteric indigestion, for which she was constantly re-

English surgeon to prescribe for one of his wives, though he would allow him no more information respecting the case than that obtained from the one symptom of the pulse, the arm being thrust from behind a curtain.

I must here make a few observations upon real consumption, and will point out those diagnostic symptoms which we are constantly and anxiously required to decide upon in the exercise of our profession; and at the same time that I shew the inflexible character of the disease, and how slight is the chance of recovery from it, I wish to inculcate the possibility of temporary, nd even of permanent cure, and to explain the rational mode of attempting it. In order to understand fully the symptoms of the stages of this formidable disease, it is necessary to bear in mind the condition of the lungs at different periods of the progress of tubercles, and the evacuation of the lung subsequently.

In speaking of consumption, I confine that term to the disease depending on the generation, growth, softening, and evacuation of tubercles; and do not apply it to any of the sequelæ of the common inflammations—catarrh, peripneumony (p. 216, line 28), and pleurisy, although they also may produce hectic, and prove fatal. Many

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sorting to purgatives, and of which the physician had rather prescribed an addition, instead of trying to wean her from the bad habit. With much difficulty I prevailed upon her to forego the temporary relief of purgatives, and to persevere with slight tonics, with terebinthinate medicines. Before long, the result was, that her health improved, she began to have a family, and lost the symptoms of hypertrophy.

A young friend of mine, in consequence of a life of over-exertion in study, pleasure, business, and dissipation combined, brought on such violent action of the heart as would have induced most persons, from the mere impulsion, to have pronounced it hypertrophy. I could see his dress move as he sat opposite to me at table. This state subsided without any medicine, by merely a more regular mode of living; having lasted from about the age of nineteen to twenty-four. Now, at the age of thirty-five, his pulse and the action of the heart are perfectly normal.

A gentleman, æt. twenty-six, consulted me under similar circumstances, but much out of condition, having been on low diet, and taking active purgatives by the direction of a physician, who declared his disease hypertrophy of the heart. He was very nervous and low-spirited, and had neuralgic pain in the chest. I allowed him to take animal food and fermented liquors, and prescribed carbonate of iron, which quieted the action of the heart, and removed the other symptoms.

These cases would of course have required different treatment, had the heart been really diseased, instead of being merely sympathetically disturbed in its function.

of the statements in works on the practice of medicine are incorrect; I believe, for instance, that tubercular consumption has no connexion with common inflammation as a cause. We find in works on the practice of physic, the particles of dust in particular trades, as glass-cutting, set down as exciting causes of phthisis. Amongst the victims of those unhealthy trades, the ordinary proportion of true phthisis of course will occur, though not produced by them. The inhalation of foreign particles of dust is the predisposing cause of chronic catarrh, chronic peripneumonia, hectic, and premature death, but not of true tubercular consumption.

Tubercles are a peculiar morbid growth in the lungs, not produced by common inflammation, but arising like scrofula, if not identical with it, and which, so far from being produced by inflammation, do themselves produce inflammation; but not till after they have grown to some size, though inflammation may incidentally occur simultaneously with their generation. The little light-coloured grains, not larger than the head of a pin, which constitute the first state, or germination, of the tubercles in the lungs, have also the names of miliary tubercles, from their resemblance to millet-seed. In this state it is my opinion that they may remain many years, without producing any symptom whatever: the person may or may not have a cough at the same time, from catarrhal affection, or sympathetic irritation; but instances occur of their being in the lungs without producing cough, though we have very seldom an opportunity of seeing this confirmed; unless sometimes, when a person dies in consequence of an accident, or some acute disease, and we discover young tubercles in the lungs. We may also observe miliary tubercles in lungs which contain besides older and larger tubercles, as it is their nature to come on in successive crops; so that we occasionally find young ones in a patient who has died in consequence of those previously formed.

I may refer to the case of a young female in an hospital, who, whilst under treatment for amenorrhœa, went out on leave of absence on an inclement day, and got an attack of peritonitis, of which she speedily died. She had no cough, though it is so common a complaint with amenorrhœal females; yet on examination of the viscera there were found a great many miliary tubercles in one lung. These miliary tubercles, except when the lung is injected with red, are more easily felt than seen, as they are of a semi-transparent grey colour, and when cut into, or bruised with the nail, have very much the appearance of the lymphatic ganglia; they grow larger by a deposition of a whitish substance resembling coagulated lymph, only denser, which seems to be deposited within them, rather than converted from them; and this substance afterwards softens to the consistence of curd, not differing in appearance from what is always formed in strumous enlargements. Whilst this white substance is firm, the tubercle is called crude, or unripe, presenting a firm white appearance when cut into; such being the second stage. The term maturation is applied to the third stage, from its having been supposed to be suppuration; as the softening of the tubercles has been erroneously considered the same as a maturation or ripening of abscesses. But this melted-down tubercular matter is different from pus, which is formed fluid in the first instance, as may be seen every day on the surface of granulating wounds or ulcers. The melting down of the tubercles is the effort of nature towards a cure. By their thus becoming liquid, the resulting creamy matter makes its way into the bronchial tubes by an ulcerative process, during which, or, more properly, during the existence of that degree of inflammation which takes place previous to the breaking, as well as whilst they are emptying, there is hectic fever; and according as the tubercles are evacuated, a number of small cavities, causing a honey-combed appearance, are left in the lung; and as the tubercles are often in masses or clusters, large pouches will sometimes remain after all the white matter is expectorated. Provided there have been but few tubercles in the first instance, a new membrane or lining invests the resulting cavities, and the patient may live on: this result is a real recovery from actual phthisis, which has by some been thought impossible. But the disease will generally return sooner or later, unless the individual die of other disease.

The nature of tubercles is not yet decided. I am of opinion that they are a strumous disease of the minute lymphatics of the lungs, growing like other tumours by the addition of coagulable lymph, which assumes various grades of organisation, and follows the course I have just described. The analogy of the morbid process is in favour of this, and also of the most successful treatment in the very few cases which recover after the tubercles have ripened. Considering this simple statement of the disease, one might be surprised that more do not recover; but we must recollect that these tubercular tumours being within the lungs, must, during their progress, induce, and be complicated with, more or less peripneumony, pleurisy, and bronchitis; besides the diminution of the pulmonary tissue so necessary to life, and the hectic wear of the constitution.

In addition to the distinct tubercles in a crude state, a mass or several masses of this crude tubercular matter is sometimes found, to which Laennec gave the name of tubercular infiltration. I believe it to be exactly similar to the other—with a deposit of lymph produced by the irritation of the tubercles, coalescing into a mass, according to the circumstance of greater or less inflammatory action. A very similar-looking deposit takes place in cases of peripneumony, to which Laennec has given the name of purulent infiltration, but which is by no means pus, but coagulable lymph; solid at first, and which afterwards melts down, like the tubercular deposit; the tubercular being the firmer of the two, perhaps from its more gradual formation.

Now, the tubercles at commencement do not necessarily produce any symptoms (as shewn in the young woman's case above mentioned, p. 221), any more than a chain of strumous knots on the lymphatics, which may frequently be felt in the side of the neck, but which produce no uneasiness, and are often reabsorbed without any remedy being used. We have no proof whatever that tubercles in the lungs are not reabsorbed, and I rather suspect they sometimes are; we can never be certain, as the difficulty that we have in ascertaining their existence in the early stage is so great, unless they be in such number that there remains little hope of recovery. Yet the progress of auscultation has been such, that we may hope for still further addition to our means of diagnosis; and the more thorough knowledge we have of the nature of the disease, the better we shall be able to combat it. Hitherto the application of remedies in phthisis has been in many cases quite empirical, often inert, and sometimes mischievously active. The student must bear in mind that it is a disease of tremendous destructiveness, and that there are but few cases within the reach of art; but he should recollect that some are curable, at least for a time,* otherwise he will lose that persevering energy which it is the duty of every medical man to exert as long as life remains: I do not say, as long as there is hope, for many patients recover, from various diseases, after all hopes have been relinquished.

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* Many years ago a young married lady, who had two children, came under my

Whoever understands the treatment of strumous cases has the groundwork of the treatment of phthisis, modifying that by calculating the nature of the organ in which the tubercular tumours are formed, and throughout making every effort to support the strength, not merely to preserve the vital powers, but for the purpose of promoting the kindly healing of the sores; for we have abundant opportunities of seeing, in surgical cases, how rapidly strumous and other ulcers get worse as the patient becomes weaker. Hence one of the great difficulties in phthisis is, that the presence of the tubercles constantly brings on inflammation, which takes the form of peripneumony, or pleurisy, and requires antiphlogistic treatment; while the risk is, that in reducing the acute inflammation we reduce the power of the constitution, and so increase the chronic or strumoid disease. Here we have an explanation of the benefit experienced by some from the use of digitalis, or hydrocyanic acid, which keeps down the pulse and the acute inflammation, without wasting the vital fluid, or depressing the system, except in cases where it disagrees with the

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care with all the symptoms of confirmed consumption, cough and muco-purulent expectoration. She had occasionally expectorated a little blood; there were night-sweats and colliquative diarrhœa. I supported her strength with animal food, and some fermented liquor, whenever her pulse could bear it: gentle exercise in the open air, and free admission of air into her rooms. I restrained the diarrhœa by catechu, logwood, and sometimes opiates; sometimes applied half-a-dozen leeches, and blisters, and gave digitalis for a few days when there was appearance of acute inflammation; sometimes gave bark and soda; sometimes quinine with diluted sulphuric acid, which restrained the sweats. Beyond my hopes, she got well, and continued so for about five years, having one child more in that time. I think that during the attack she had expectorated a crop of tubercles; but I cannot be certain, as I had not then practised auscultation. However, after the five years, she had a renewal of all the symptoms; and I know that she then had cavities in the lungs, as I ascertained by auscultatiion that there was crepitation, pectoriloquy, and cavernous respiration. From this she recovered again in about a year; and when she regained her strength had another child. Within two years from her second recovery she had another return of the same symptoms, and died,—the lungs, upon examination, being full of large cavities. The process of utero-gestation is said to suspend the progress of phthisis; but in this case the period occupied by one pregnancy bears a small proportion to the interval between the first and second attack.

stomach, and then of course it does mischief by weakening. And because digitalis had proved useful, it has been recommended and used empirically, that is, indiscriminately. Being, however, employed in so fatal a disease, it of course lost its character, except in the hands of those practitioners who could understand in what states it was occasionally beneficial, and would limit its use to them; knowing that, in the cases of phthisis with a feeble pulse and no tendency to acute inflammatory action, it could do nought but harm. Again, the constant repetition of emetics in phthisis, as well as in abscesses, has done good on a similar principle, by checking the deposition of new matter, and facilitating the removal of old; as elaterium is useful in dropsy by its emetic as well as purgative properties. But the repetition of emetics is so distressing, and the chances of curing phthisis are so doubtful, that few persons now prescribe this mode of treatment, which was at one time much praised and resorted to in this disease, as well as by surgeons for the removal of abscesses.

Some years ago a gentleman of the name of Stewart adopted a rational mode of treatment, with which he had considerable success; but because he could not work miracles, his plan was unjustly depreciated. His method was entirely tonic, and especially the cautious use of cold and tepid ablutions of the skin—a modification of cold bathing; a remedy which is found so uniformly beneficial in promoting the resolution of strumous tumours. Some patients with phthisical symptoms recovered strength for a time under his directions. Others had a recurrence of their symptoms, and died; but this should not be held an argument against the propriety of his treatment, which brought the patient through one crop of tubercles, though a second or a third crop proved fatal. The hydrocyanic acid, again, has been of great use in some cases; but not being able to effect impossibilities, it has shared the fate of digitalis and of Mr. Stewart's plan.

One great advantage of auscultation is that of enabling us to decide whether any cases of consumption are cured or not (p. 224, note). Previous to its discovery, if a case recovered a doubt always existed whether the patient had been really consumptive, as in Stewart's cases; whilst all who died were put to the account of consumption, without any reserve. I may here recapitulate a few of the auscultatory observations made in practice. If few miliary or even crude tubercles be deposited in the lung, no evidence is afforded by auscultation or percussion; if there are many, or tubercular infiltration has taken place (and we may almost always expect to find them near the clavicles), there is diminution of respiratory murmur; but from the solidification more or less bronchial respiration or bronchophony, and some diminution of sound on percussion, occur. Whereas, if the patient's cough be produced by catarrh, the sound on percussion will not be dull, and there will not be bronchophony; and if the murmur be diminished by emphysema, the sound from percussion will, on the contrary, be extra loud. In the progress of the disease there is no alteration in these auscultatory signs, except augmentation, until the tubercular matter, having ripened, begins to make its way into the spongy texture of the lungs and bronchia, when a kind of crepitation is heard, being a mixture of rhonchus mucosus with the rhonchus crepitans, or what Laennec calls sub-crepitans, and partaking more of the pure crepitation in proportion as, about this time, the lungs may become in a peripneumonic state just round the tubercles, or the rhonchus mucosus be mixed up with œdematous crepitation when the consumption has brought on dropsical symptoms; besides which we find occasional admixture of rhonchus sonorus gravis, or sibilans, which must not be confounded with the diagnostic signs, but which we need not here analyse, as that may be done with facility and advantage at the bed-side. When the sounds cannot be satisfactorily heard during respiration, the patient must be made to cough, so as to remove any mucus which may be obstructing the tubes, and preventing the real state from being heard. After the crepitation has lasted some time, we begin to have new sounds, according as the cysts of the tubercles get cleared out: when quite empty, cavernous respiration and pectoriloquy may be detected; when they contain some soft tubercular matter, and pus or mucus, we hear cavernous guggling rhonchus. The sound from percussion at that period alters, becoming louder again, on account of the hollowness from the excavations.

Pectoriloquy is a certain evidence of the existence of an excavation; indeed a cavity not larger than a nutmeg, or even less, produces pectoriloquy distinctly. In one instance I had a patient with aneurism of the aorta, in whom, during examination of the chest, pectoriloquy was observed in one spot only, which was between the scapula and spine, and which sometimes ceased to be discoverable for a day. After death this was accounted for; it was found that that disease of a vertebra, close to the head of a rib, had caused a small abscess, which, instead of pointing externally, had made its way into the lung, through which the pus was evacuated. This cyst, not so large as a nutmeg, gave pectoriloquy when empty; but when full of pus, as when he had been lying quiet, of course emitted no sound.

I must observe, that nosological symptoms are not sufficient to establish the existence of tubercular consumption; the whôle train of symptoms may occur as the production of an ordinary cause (p. 216, l. 26); such as catching cold from wet feet, producing peripneumony or pleurisy in the first instance; the sequelæ of either are, not unfrequently, hectic, with cough and expectoration, the latter of which might be so similar to phthisis, that if it were alone considered, it would be presumptive evidence of phthisis. Expectoration of blood would be by no means inconsistent with the supposition of the disease being only pleuritic in the first instance; and I must here take the opportunity of observing, that though there are not many cases of phthisis in which there is not some expectoration of blood at some period, still that many cases of hæmoptysis occur without being connected with tubercular disease, and more especially in females. The heightened colour of the cheeks may not be found circumscribed in the forenoon, which is worthy of attention, shewing how perfect an intermission there may be, though the hectic be fully formed, so as to produce hot dry skin and circumscribed hectic flush in the evening; followed by night-sweats, or rather morning sweats, for the phthisical patient is generally hot, dry, and restless till four or five o'clock, when a sleep comes on, which soon terminates in an uncomfortable state of perspiration. The patient in phthisis, during the later stages, has usually an aphthous state of the mouth, the fauces being inclined to be sore, as well as the back of the tongue, with a whitish pellicle, the tongue florid and glazed, as if skinned; but neither this thrush in the mouth nor night-sweats are diagnostic of tubercles, they being met with in hectic from any cause—dysentery, for instance, or from abscess in the liver or groin, psoas abscess, &c. But if, added to the preceding symptoms, we have the signs of true phthisis derived from auscultation, all doubt will be removed, and we have only to trust to the means of supporting the strength and allaying morbid sensibility.

In various parts of both lungs, in cases of phthisis, there will generally be found tubercles in different stages, explanatory of the symptoms noticed during lifetime; and also ulcerated appearances in the intestines at the termination of the ilium and about the sigmoid flexure of the colon, explanatory of the distressing diarrhœa which constantly occurs in these cases in the latter stages.

The thrush in the mouth in phthisis is generally coeval with, and indicative of, an ulcerated, aphthous, or thrushy state of the bowels; but we must not imagine that aphthæ, especially in young persons, are always accompanied with ulceration of the bowels; for children have thrush very frequently when debilitated by diseases, such as from teething or worms, from which they rapidly recover when the cause is removed.

Before we possessed the means of diagnosis established by Laennec, some cases used to be thought phthisis laryngea, on account of the loss of voice and incessant "laryngeal" cough, affording false hopes that counter-irritation on the throat, &c. might effect a cure. Formerly many a case of phthisis used to get the name of a liver-cough—that is, when accompanied by a pain in the right hypochondrium, costiveness, and indigestion; but now the auscultatory symptoms tell too truly the state of the lungs.

In many cases of phthisis, I may repeat, there occurs the superaddition of peripneumony, pleurisy, hæmoptysis, or catarrh, or complications with disease of other viscera; and often dropsy comes on at the last, and hastens the fatal termination, or that pleuritic and purulent effusion into the chest which Laennec calls empyema. When there is hæmoptysis, peripneumony, or pleurisy, or any complication requiring antiphlogistic treatment, we must recollect the analogy between the phthisical and strumous constitutions, and save the strength of the patient as much as possible. I would advise the young practitioner not to bleed patients beyond what is absolutely necessary to check inflammations in any case, but more especially in those superadditions which occur during the progress of tubercular phthisis. In peripneumonia or pleuritis, with a consumptive habit, we must avoid the risk of knocking down the constitution, if possible; but I confess we are sometimes placed between two evils, and must then choose the lesser, as well as we can judge.

One thing of which I am convinced, is that the true principle of treating consumption is to support the patient's strength to the utmost; and that though *occasional complications* may call for antiphlogistic treatment, *tubercular disease by itself* does not. I must again caution young practitioners against shutting up phthisical patients in warm rooms. I am satisfied that the want of exercise induces a languor which makes them wear out faster than if permitted to ride or walk, according to their strength, in the open air. At every exacerbation of their complaint, phthisical patients say they have "caught fresh cold:" but the same thing occurs when the experiment is tried of keeping them in rooms graduated by a thermometer. A mild climate is palliative, by permitting more free exercise in the open air: but when we look at the specimens in our museums, we may judge whether a warm climate could regenerate such lungs.

The question remains undecided whether a warm climate can control tubercles of the lungs. Upon the analogy with struma we might infer that it could; but we must recollect that, notwithstanding their close analogy and relationship, the diseases are not identical. I have had several strumous patients under my care, more or less constantly, for from twenty to thirty years, who have had at various times the general symptoms of tubercular phthisis, cough, profuse expectoration, hectic, diarrhœa, &c., some still alive, others who died, but not of tubercles. On the other hand, there are abundant cases of tubercular phthisis which shew no strumous symptom as to constitutional appearance or disease. I have shewn that the medicinal and dietetic treatment which suits strumous is the best for the phthisical cases, and there is no doubt that delicate strumous patients are much benefited by change of climate to Italy, or the south of France; and that scrofula increases as we go into cold, damp regions, and decreases as we go south; hence we might infer that a mild climate may favour the general health of delicate persons, so as to retard or prevent the incipient stage, or formation of tubercles, whilst, on the other hand, we must confess that consumption occurs in some most robust, previously healthy individuals, who evinced no necessity for any such precaution; the only thing is, that the inhabitants of the milder regions suffer less from consumption: yet few persons can submit to the inconvenience and expense of taking their children to the Continent as a matter of precaution, which may after all be unnecessary, as there are plenty of delicate persons who never become consumptive, and plenty of robust ones who do. When unequivocal symptoms of tubercles set in, it is too late (p. 218), except in such cases as may rally in this climate (p. 224, note).

To return from this long digression upon phthisis, we may consider chronic diarrhœa to be, in fact, frequently a catarrhal state of the mucous membrane of the intestinal canal, and requiring to be treated on the same principles as explained p. 213, whether it arise from mere sympathetic morbid sensibility, as in hysteric females, or from chronic inflammation of the membrane itself, or congestion, or mere loss of tone combined with indigestion, in which hæmatoxylum and other astringents must be substituted for expectorants. In the diarrhœa which occurs from the necessary administration of mercurials, hæmatoxylum will be found a most valuable remedy, with or without opiates; and also in the chronic diarrhœa of gouty habits, &c. In the diarrhœa of children it is most valuable, and possesses the advantage, for them, of having no disagreeable taste.

The consideration of the internal rete mucosum naturally leads me to say a few words concerning the external rete mucosum, as the seat of CUTANEOUS diseases, the cure of which has been much retarded by the well-intended labours of the nosologists. Their time has been wasted in making distinctions between diseases which are as like one another as one horse is to another; or resembling each other as much as a horse does a mule, or an ass a zebra—the species of each genus of disease being curable by the same means; so that, in fact, the true service to medicine would have been to have shewn wherein the different varieties resembled each other in essential points, so as to cure them on principle.

The first great distinction we have to establish in cutaneous diseases is between the contagious and non-contagious. In the former class we can include with certainty two only—the itch and the ringworm of the scalp, or scald head (*porrigo*). Whatever other chronic eruption the young practitioner is consulted about, he may at once answer for its not being contagious; but it will require a little experience to enable him to distinguish the various forms which the itch, for example, assumes. To assist him, however, he may recollect one unaccountable peculiarity which it exhibits, of never affecting the face. The itch is sometimes papular, sometimes pustular, sometimes vesicular, sometimes scaly, though unequivocally the same identical disease; in other words, according to the state of the constitution, the same irritating cause—recently demonstrated to be a peculiar insect (*acarus scabiei*)—may produce a disease resembling prurigo, eczema, impetigo, or ecthyma; the itch, in fact, communicated from a patient who has it in the pustular form may produce it in another person in the vesicular or papular state; and from analogy I infer, that the various cutaneous eruptions are but degrees of one state—a morbid sensibility and loss of power in the capillaries (chronic, sub-acute, or acute inflammations) of the rete mucosum, assuming various forms according to the age and constitution of the patient; as we see morbid sensibility propagated from the gums produces in infants strophulus, or porrigo larvalis, diseases never seen in adults, or if they occur, are in them called prurigo, lichen, or herpes, or something equivalent, distinguishable certainly, because the difference of age modifies the appearance, though not the quality.

I believe it will be found perfectly useless, *as far as treatment is concerned*, to make any further division of chronic cutaneous diseases than into the papular, scaly, pustular, and vesicular. I really see no use in the interminable hair-splitting distinctions made by authors, from Willan down to the present time; and they are most appalling to the unhappy student, leading to vain repetitions in description of remedies, and an empiricism which excludes or confounds the principles of treatment.

The first or lowest degree of derangement is PAPULAR, or simple itching, which is sometimes not even evidently papular; in which the nerves evince morbid sensibility only, the first degree of debility, leading to congestion of the capillaries in those points.

Next comes the thickening, *i. e.* relaxation and sponginess of the rete mucosum in various points, the relaxation being sufficient to cause a slight loosening of the cuticle, which adheres in SCALES.

The third is the PUSTULAR, when the relaxation has gone the length of some minute loss of substance, which the surrounding healthy capillaries set about restoring by granulation and suppuration of pustules.

The fourth might be thought by some to be a minor degree, because apparently more simple—the mere separation of the cuticle in the form of VESICLE; but, on the contrary, this is a higher, being a more rapid inflammation; and, moreover, we see analogically that these vesications take place in connexion with the erysipelatous state of disease which evinces loss of power of the constitution. Vesicular ecthyma takes place in weak strumous patients; mercurial vesicular disease, when the constitution is suffering from the mineral; pemphigus and vesicating patches of purpura or scurvy, when the constitution is in the worst state.

The co-existence of disease of the lining of the intestinal canal and skin, or of the internal and external rete mucosum, has been universally observed and acknowledged. This connexion I attribute to the whole being supplied by the ganglionic system of nerves, whereby an impression is produced on the skin through the primæ viæ, as when cold water drank during perspiration produces scaly eruption on the skin, or when, *vice versâ*, applied to the skin, it produces pain in the stomach and bowels and diarrhœa, and as iron or arsenic taken into the stomach cures cutaneous eruptions, or a warm bath relieves diarrhœa.

I defy any person to apply remedies for cutaneous diseases with any degree of precision by the directions of Willan or any of his followers. But enough has been said in the preceding pages, to guide to the application of remedies, on principle, to these chronic inflammations and their consequences. In the first place, tonics, such as iron, mercury, and arsenic, cure in two ways—by their direct effect upon the vessels of the skin when circulated to them, and by their effect upon the primæ viæ in giving tone: we must not, however, produce salivation by the mercury, nor inflammation of the bowels by too free use or abuse of mercury or arsenic. Iron, again, injudiciously applied, will rather retard digestion, of which it is the greatest promoter in proper doses, which doses are relative, as has been already shewn. Compound decoction of sarsaparilla, with the mezereon and decoction of dulcamara, are most valuable remedies; but if the stomach and bowels be oppressed by them, they do no good. I have shewn (p. 154, note,) how remedies sometimes fail from being too energetic. In cases of psoriasis, in which the usual routine of "specifics" had been tried by various practitioners unavailingly, because too freely applied, seeing that the patients were of a very delicate though not unsound constitution, with weak digestion though no want of appetite, I have given the mildest tonic, the sulphuric-acid lemonade, which has rapidly cured the previously intractable psoriasis.

Some cases of psoriasis, &c. are accompanied by, or depend upon, a congested sub-inflammatory state of the mucous membrane of the stomach, evinced, besider the presence of general signs of indigestion, by occasional nausea, and a foul or too red tongue, or both together, a hard pulse, precordial uneasiness, or palpitation. In these cases the emetic substances, such as ipecacuanha and colchicum, in doses just short of nauseating, and continued for some time, are highly useful, combined or alternated with tonics and sedatives, bismuth, logwood, prussic acid, &c.

Antimony circulated to the cutaneous vessels is most valuable, but we are told it often fails—we are not told why: the reason is, that the cutaneous eruptions not being acute diseases, not febrile, there is little tolerance of antimony, and therefore the common doses are often oppressive. It cannot be too often repeated, that persons frequently give much too large doses of remedies in chronic diseases and thereby fail. And again; the sedative antimony cannot cure the eruptions of broken-down constitutions, which require tonics and full diet; and in such cases, as the primæ viæ are weak, it is often a difficult matter to get them to profit by the tonics and diet; and therefore we may be obliged to begin by the mildest, such as hæmatoxylum as a tonic, and milk, with perhaps a little brandy in it, as nourishment; or the sulphuric-acid lemonade, with animal broths and jellies, and farinaceous diet. Warm and vapour baths are commonly useful by softening the scaly eruptions; and at the same time the warm bath is a powerful means of soothing the primæ viæ, and restoring them to tone and digestive power; but in some of the papular eruptions the heat often rather increases the tingling of the skin.

Alkaline washes are highly useful to excite the relaxed vessels of the skin; but they require great varieties of dilution, according to the sensibility of the parts. The same may be said of mineral acid washes; the alkaline washes are generally preferable, as more cleansing. The dulcamara has a powerful effect externally as well as internally. We may use mercury as a tonic to the primæ viæ and the capillaries, being mindful not to salivate, not to oppress by overdoses of antimony, hydriodate of potass, &c.; and in chronic cases, when remedies fail, to recollect that they may have been used too freely. In fine, the successful treatment of skin-diseases depends upon no "specifics," but a judicious application of medicines, diet, bathing, air, and exercise,* on account of the state of the digestive organs.

In the foregoing pages I have endeavoured to lay down general principles, which may apply to the particular cases, of disease as they occur—these principles being deduced from physiology; and for the explanation of pathological phenomena I have referred to the action of capillaries and nerves—nerves and capillaries together, not artificially separated, but as they exist in nature—ramifying with and supporting each other throughout; for by their combined action upon the blood sent to them by the heart, they produce the phenomena of health—in their deranged actions they originate disease. I have also tried to explain the nature of remedies; and I have only to add that, in applying them, though not a moment should ever be lost, we must have patience in allowing them to act; and that, though inert practice is mischievous, the safety of the patient depends upon *ne quid nimis*.

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* Exercise on horseback has immeasurable advantage over every other kind, as it gives motion to the viscera without fatiguing the limbs; very little motion is given to the viscera in walking or in carriages

INDEX.

Abscess, 58, 123, &c.
—— pointing of, 123.
—— artificial opening, 123.
Absorbents, 60.
—— lacteal, 27.
—— uses of, 29, &c.
—— action ? 208.
Absorption, 28, 60.
—— and deposition balance, 28
—— of solids, 29, &c.
—— of matter, 58.
—— how influenced, 208, &c.
Acarus scabiei, 230.
Acid, sulphuric, 94, 233, &c.
Acidity of stomach, 118, &c.
Acids, mineral, 97, 151, &c.
Aconite, 30, &c.
Action, 72.
—— depending on nerves, 35.
—— organic, 35, 36.
—— not strength (fever), 89.
—— capillary, 119, 126, &c.
—— muscular, 119.
Acute inflammation, 63.
Adhesions, 55, 56, &c.
—— peritoneal, 56.
—— pleuritic, 56.
Adhesive process, 60.
Ague, 72, 89, 90, 145, 179, &c.
—— colour of skin, 183.
—— only two stages, 183.
—— dead, 184, &c.
—— masked, 184.
—— rheumatic, 185.
—— ophthalmic, 185.
—— paralytic, 185.
Ague, typhous, 185.
—— remittent, 185.
—— treatment, 186.
Alcohol, 73, 75, 78, 114.
Alkalies, 118.
"Alteratives," 91.
Amenorrhœa, 212, &c.
Ammonia, *diffused*, sedative, 133.
—— *local*, stimulant, 133.
Anæsthetics, 96.
Anæmia, iron not specific in, &c. 96.
Analogies, when resorted to, 25.
Anatomy, pathological, where insufficient, 25, &c.
Animal heat, 38.
Anodynes, 82, &c.
Anorexia, 100, 175.
Antimony, 92, 200, *et passim*.
—— action of, 70, &c.
—— in fever, 141.
—— in surgical cases, 141.
Antiphlogistic treatment, 60, 85.
———— carried too far, 59, 60.
—— diet, 102.
—— bleeding, 102, &c.
—— digitalis, 102, &c.
—— medicines, 102, &c.
—— opium, 103, &c.
—— morphia, 103, &c.
—— colchicum, 103, &c.
—— stimulants, 129, 203.
—— tonic, 129, 204.
—— narcotic, 173, &c.
—— wine, 203.
—— emetic, 204.

Apoplexy, 175, &c.
—— temporary, 176.
Apparatus which supports life, 26.
Arsenic, 64, 88, 97, 135, &c.
—— and opium, 64.
—— antidote, 64.
Arterial action antagonistic to the heart, 41.
Arteries, xvii.
—— enlarged by inflammation, 27, &c.
—— action of, 30, 34, &c.
—— stream of, continuous, 30.
—— how kept full, 30.
—— not muscular, 31.
—— jet from wounded, 31.
—— substance of, 31.
—— tella elastica, 31.
—— deceptive sensation of dilatation, experiment to prove, 32.
—— middle coat, 32.
—— motion of, where visible, 32.
—— serpentine movement of, 32.
—— stretch longitudinally, 32.
—— uniformity of calibre, 32.
—— dependence on nerves, 39.
—— debility of, 40.
—— throbbing of, in inflammation, 40, 41.
Asthma, 217, &c.
Auscultation, xv., xvi., 210, 215.
—— how to learn, xvi.

Balsams, 213.
Bandages, 53.
Bark, 72, 198.
—— objections to, 135.
Baynton, 53.
Beer, ginger, 119.
—— spruce, 119.
—— in fever, 147, *note.*
—— in inflammation, 203.
Belladonna, 82, &c.
Bile, use of, 26.
—— in fæces, colour of, 153.
Bismuth, 97, &c.
Bitters, 97.
Blood, how supplied, 27.
—— venous, 27.
Blood, arterial, 27.
—— colour of, 27.
—— red particles, 27.
—— serum, 27.
—— crassamentum, 27.
—— cruor, 27.
—— circulating force of, 33.
—— moving powers of, 33.
—— "detained" by disease, 45.
—— determination of, 45.
—— proportion consumed in the system, 50, &c.
—— extravasated, 58.
—— effects of loss of, 77.
Boil, 123.
Bone, deposition of, 28, 67.
—— growth, 29.
—— repair, 29.
—— carious, 29.
—— removal of, 30.
—— channels in, 30.
—— absorption of, 31.
Black-drop, 86.
Bleeding, xi, 67, 69, 76, 198, &c.
—— excessive, 112.
—— raising pulse by, 96, &c.
—— relieves diarrhœa, 126.
—— —— costiveness, 126.
—— necessity for, 146.
—— from a distant part. 143.
Blisters, 61, 67.
—— not rising, 38, &c.
—— gelatinous exudation, 62.
Blood-letting, 59, *et passim.*
—— fatal, 60.
—— vomiting from, 125.
Blue pill, 109, &c.
Blushing, 43, 120.
Brain, 35, 75.
—— inflammation of base, 186.
Bronchi, xviii. &c.
—— muscularity, xviii.
Bronchitis, 99.
Broussais, 96, 117.
Brunonians, 132.
Burns, 43, 54.
Callus, retarded by inflammation, 66.

Calomel, 86, 117.
Caloric, 114.
Cancer, 170, &c.
Cannabis, 84.
Cantharides, 44, 61, 64, 67, 112.
—— act on nerves, 44.
Capillaries, 27, 68, 115, *et passim*.
—— enlarged by inflammation, 27.
—— dependence on nerves, 39.
—— —— nervous influence, 42, 43, 44.
—— when visible in inflammation, 39, 43, 44.
—— metallic salts act on, 68.
—— influenced by medicine, 70, 105.
—— action arrested, 119.
—— —— influenced by, 120, &c.
—— influenced by nerves, 121. &c.
Capillary action, 126.
Capsicum, 112, &c.
Carbon from lungs, 48.
Carbuncle, 123, &c.
Cases, use of, 11.
Catarrh, 55, 93, 99, 100, 218.
—— "dry," 99.
—— of urethra, 214.
—— of vagina, 214.
—— diarrhœal, 230.
—— intestinal, 230.
Cathartics, 125, &c.
Caustic to ulcers, 54.
Cayenne pepper, 117, &c.
Cellular, diffused, inflammation, 59.
Cell-formation, 47.
Cells of secretory ducts, 47.
Chancre, 63.
Chicken-pox, 62.
Chilblain, 69, 116, &c.
Chilblain in the larynx, 216.
Chloroform, 76, 77, 165.
Chlorosis, iron not specific in, 96.
Cholera, 94, 187.
—— cases, 192, 193.
Cholic, 125, &c.
Cholic, painters', 125.
—— treatment of, 125.
Chorea, 174, 179, &c.
Chronic inflammation, 63, &c.
Chyle, 27.
Chyme, 26.
Cicatrix, 52.
Cinchona, 89, &c.
Cineritious, 35.
Circulation of the blood, 26.
—— hydrostatic principle, 34.
—— "equalising," 70.
Clinical surgery, 26.
—— medicine, 26.
Club-foot, 160.
Coagulable lymph, 52, 55, 56, &c.
—— use of, 51.
—— in cornea, 55, 165.
Cod-liver oil, 206.
Coffee, 78, 80.
Colchicum, 72, 91, 116, 198, &c.
Cold, 67, &c.
—— in scarlatina, 50.
—— action on kidneys, 49.
—— in inflammation of viscera, 153.
Coma, 77, &c.
Conception, 129.
Congestion, 126, &c.
—— relief of, 42, 46.
—— sources of, 42.
—— passing into inflammation, 46.
Constitutional disturbance, 124, 127, &c.
Constringents, 112, 113, &c.
Consumption, 220, *et seq.*
—— tubercular, 220.
—— causes, 220.
—— incipient, 221.
Consumption curable? 224.
—— strumoid, 224.
—— treatment, 224, &c.
—— Stewart's plan, 225.
—— digitalis, 225.
—— hydrocyanic acid, 225.
—— laryngeal? 228.
—— complications, 228.
—— climate in, 229, &c.

Contagion, 63, &c.
Contractility, arterial, 35.
—— organic, 35, 36.
—— muscular, 35, 36.
—— vital, 39.
Contradictions, apparent, 95, 96, 126, 127, &c.
Convulsions, 54, &c.
—— without pain, 54, &c.
—— from worms, 54.
Cornea, inflamed, 55.
Costiveness, 118, &c.
Cough, whooping, 213.
—— obscure causes, 214
—— hysteric, 214, 215, &c.
—— liver, 215.
—— heart, 214.
—— from hot air, 216.
—— diagnosis, 216, 217, 218, &c.
—— climate for, 217, &c.
—— tubercular, 217, &c.
—— auscultation, 219.
—— consumptive, 220, &c.
—— laryngeal, 228.
Counter-irritation, 67, &c.
Creosote, 122.
Croton oil, 112, 116, 117, &c.
Croup, 61, &c.
Cubebs, 121, 122, &c.
Cutaneous diseases, 230, &c.
—— unnecessary distinctions, 231.
—— contagious, 231.
—— non-contagious, 231.
—— specifics? 232.
—— mercury in, 232.
—— antimony in, 232.
—— baths, 233.
—— alkalies, 233.
Cuticle, renewal of, 61.
Cyst of abscess, 58.

Death from cold, 141, &c.
—— of a part, 123, 124, &c.
Delirium, 73, 86, &c.
—— in surgical cases, 38.
—— rationale of, 78.
—— of inanition, 115.
Delirium, tremens, 77, 115.
—— from digitalis, 164.
Deposition and absorption balance, 29, &c.
Depression from stimulants, 96.
Determination of blood, 45, &c.
—— illustration of, 46.
Diagnosis, 69.
Diarrhœa, 98, 230, &c.
"Diathesis," 153.
Diet, 100, 121, &c.
—— in fever, 100.
—— in surgical cases, 100.
—— regulation of, 119, 121, &c.
Diffused cellular inflammation, 59.
Digestion, 26, 74, &c.
—— promoted by sleep, 74.
Digitalis, 76, 78, 102, 115, 125, 198, &c.
—— when procures sleep, 104.
—— inconveniences of, 104.
Diseases, how to be studied, 26.
Disease (definition), 51.
—— provision of nature, 51.
—— vis medicatrix naturæ, 51.
—— conjoint affection of vessels and nerves, 135.
—— acute, 135, &c.
—— chronic, 135, &c.
Disorganisation, degrees of, 42.
Diuretics, 50, 115.
Diuretic effects, 50, 51.
Dover's powder, 85, &c.
Dressings, to ulcers, 53.
—— with dry lint, 53.
—— water, 53.
Dropsy, 61, 207, &c.
—— leucophlegmasia, 208.
—— a secondary disease, 209, &c.
Dropsy, treatment, 210, &c.
Dry gangrene, 56.
Dulcamara, 92, 232, &c.
Dysentery, 153, &c.
Dyspepsia, 205, &c.
Dyspnea, 68, &c.

Ecchymosis, 58.
Elaterium, 209, &c.

Electricity, 114.
—— analogy with nervous influence, 35.
—— in inflammation, 45.
—— of nerves, 113, &c.
Emetics, 125, &c.
—— miscalled stimulants, 79.
—— sedative, 79, 125.
—— to prevent suppuration, 142.
—— to check inflammation, 142.
—— in fever, 143.
—— in ague, 194, &c.
Emphysema, 217, &c.
Empyema, 58, 208, 174.
Energy, nervous, 39, &c.
Epilepsy, 162, &c.
Error loci, 49.
Eruption, variolous and vaccine, 62.
Exostoses, 66.
Erysipelas, 44, 61, 122, 123, 201, &c.
—— pain precedes the redness, 44.
—— seat of, 201.
—— shingles, 201.
—— from leeches? 201.
—— treatment, 205, &c.
Erysipelatous, 123, &c.
Escar, 57.
Ether, 76, &c.
Exanthemata, 152, &c.
—— variations in, 150, &c.
—— scarlatina, 150.
—— small-pox, 151.
Exercise, horse, 232.
Exhalation, 27, 28, &c.

Fæces, appearance of, 153, &c.
False membranes, 55, &c.
—— —— uterine, 55.
—— —— intestinal, 55.
—— —— vaginal, 55.
—— —— in croup, 55.
Fatigue, 73.
Fear opposed to blushing, 42.
Fermented liquors, 74, 93, 101, &c.
Fever, 38, &c.
—— "New," of Sydenham, 128, *et seq.*
Fever, produced by state of nerves, 128, &c.
—— causes, 128.
—— treatment, 128, &c.
—— inflammatory, 128, &c.
—— typhoid, 130.
—— synochus, 131.
—— typhus, 131.
—— sedatives in, 131, &c.
—— depletion, 131, &c.
—— stimulants in, 131, &c.
—— Brunonian practice, 132.
—— sensorium in, 130, &c.
—— new Italian practice,—Rasori, Aglietti, Broussais, 132, 135, 143, &c.
—— "contra-stimulant," 132.
—— stimulants in, 133, &c.
—— symptoms of sinking, 133, &c.
—— ammonia in, 133.
—— organs predisposed to disease in, 133, &c
—— visceral affection in, 134.
—— lesion of nervous system, 134.
—— where located, 135.
—— various opinions as to seat of, 135.
—— ague, 135.
—— various treatment, but essentially coinciding, 135.
—— bleeding in, 134, &c.
—— emetics in, 134, &c.
—— purgatives in, 134, &c.
—— treatment or analogy with inflammation, 137.
—— infectious, 137.
—— produced by morbid poison, 137.
—— mild, 137.
—— conditions necessary to recovery, 138, &c.
—— diet in, 138, 143, &c.
—— sedatives in, 140, 141, &c.
—— mercury in, 140.
—— salines, 141.
—— concomitants of, 143.
—— leeches in, 143.
—— indirect practice, 143.
—— dusky colour of skin, 144.

Fever, Rasori, 144.
—— duration, 144.
—— resembling pneumonia, 144.
—— emetics, 144.
—— stimulants, when necessary, 146, 149, &c.
—— essence of, 147.
—— appearance of eyes, 147.
—— crisis, 147.
—— "cut short," 148.
—— definite course, 148.
—— narcotics in, 149.
—— exanthemata, 150.
—— contrasted with pyrexia, 152.
—— a specific typhus? 156.
—— the rash in, 156.
—— but one kind, 157.
—— distinguished from neuroses, 161, 174, 178, &c.
—— "irritative," 169.
—— hectic, 170.
—— intermittent, 179, *et seq.*
—— remittent, 179, 186, *et seq.*
—— Bombay, 182.
—— miasma, 183.
—— malaria, 183, &c.
—— rheumatic, 198.
Feverishness, 73, 129.
First cause, 28.
"First intention," 51.
Fracture, ununited, 66.
Fruit, 119, &c.
—— in gout, 119.
—— in calculous disease, 119.
Frozen to death, 155.
Functional disease, 25.
Functions, 25, &c.
—— deviations of without disease, 25.
Furunculus, 122, &c.

Galvanic phenomena of nerves, 113, &c.
Galvanism, 72, 113.
Gangrena, 57, &c.
—— senilis, 93.
Gastro-enteritis, 143, &c.
Glands, structure of, 47.
Gonorrhœa, 121, 122, &c.
Goulard, 121.
Gout, 72, 74, 161, 200.
—— in the stomach, 65.
Granulation, 52, &c.
—— union by, 52.
—— spongy, 52, 53.
—— weak, 53.
Gravel, 115, &c.
Growth, 27, 28.
—— diseased, 65, &c.
—— syphilitic, 65.
Gums, sore, from mercury, 72, &c.

Hæmatoxylum, 155, 230, &c.
Hæmaturia, 115, &c.
Hæmoptysis, 109, 212, 227.
Hæmorrhage, 124, 211, *et seq.*
—— convulsions from, 124, &c.
Hæmorrhoids, 121, &c.
Hamilton on purgatives, 117.
Health, 51.
Healing, dependence on nerves, 39.
Heart, 26, 39, 206.
—— action of, 30, 32.
—— how refilled, 32.
—— no active dilatation, 32.
—— impulsion, 32.
—— palpitation, 32.
—— sounds, xx, 32.
—— valves, xviii.
—— sound, *see* "Advertisement to Second edition."
—— right auricle, how filled, 33.
—— Heart, auricle use of, 33.
—— power of, 34.
—— hypertrophy, 103, 220.
—— how to diminish exertions of, 141.
—— simulated, 206, 207, &c.
—— diagnosis, 219, 220.
Heat, animal, 38.
Herpes zoster, 122, &c.
Hydrocyanic acid, 103, 104.
Hydrophobia, 64.
Hydrothorax, 208.
Hypnotics, 82, 83, &c.
Hyoscyamus, 82, &c.
Hysteria, 50, 109, 117, 129, &c.
—— sympathies of, 109, &c.

Hysteria, affections of, 109, &c.
—— dysmenorrhœa, 109, &c.
—— palpitation, 206, *note.*
—— puerperal, 213.
Ichor, 53.
Inanition, 78, &c.
Infections, 64, &c.
Iodine, 68, 71, 208.
Indigestion, 74, 118, &c.
Inflammation, 27, 39, 67, 71, 120, &c.
—— theory of, 39, *et seq.*
—— diminished arterial action in, 39, &c.
—— cold in, 39, 121.
—— astringents in, 39, 124.
—— pathology of, 39, 40, 42.
—— how to diminish, 39, 41.
—— proximate cause of, 39, *et seq.* 43, 67, 101, &c.
—— motion of the blood in, 40.
—— indication of cure, 41.
—— bleeding in, 41, 67.
—— medicines in, 41.
—— and congestion, 41.
—— —— difference between, 42.
—— degrees of, 42.
—— alteration of tissue, 42.
—— from electricity, 42.
—— —— burns, 42.
—— progress of, 43.
—— commences in the nerve, 43, &c.
—— cure of, 44.
—— "blood invited to," 45.
—— diminished organic action, 45.
—— pressure in, 46.
—— bandaging in, 46.
—— healthy (?) 55, 60.
—— ulcerative, 57.
—— diffused cellular, 59.
—— restorative, 59.
—— duration, 59.
—— subdued tenderness after, 59.
—— treatment, 59, 89, 97, 128, 171.
—— latent, 60.
Inflammation, "adhesive" preventing hæmorrhage, 60.
—— artificially produced. 60.
—— separation by, 61.
—— softens tissues, 63.
—— acute, 63.
—— chronic, 63.
—— passive, 67.
—— "knock down," 67.
—— syphilitic, 70, &c.
—— from cold, 71.
—— —— mercury, 71.
—— varieties of, 97.
—— nature and treatment, 99, &c., *et seq.*
—— local, 101.
—— resolution, 101.
—— constitutional disturbance from, 101.
—— sleeplessness from, 101.
—— pulse, 102.
—— warmth in, 120,
—— nerves in, 120.
—— in weak constitution, 123; &c.
—— but one, 124, &c
—— morbid sensibility in, 126.
—— pyrexia from, 127.
—— series of symptoms from, 127, &c.
—— stimulants in, 149.
—— contrasted with morbid sensibility, 169, 173, 186.
—— how destroys life, 169.
—— narcotic in, 174.
—— rheumatic, 197.
Influenza, 195.
—— cases, 197.
Irritation, vii. 45, 46, 68, 106.
—— congestion from, 46.
Irritable sores, 93.
Iron, 96, &c.
—— muriated tincture of, 115.
Issue, management of, 56, &c.
Itch, 72, 73, 231.
—— animalcule, 73, 231.

James's powder, 141.

Kidneys, in hysteria, 49.

Kidneys, sympathies of, 103, &c.

Lacteals, 27.
Laennec, 210.
Latent disease, 26.
Lectures, use of, 26.
Lemonade, " mineral," 149.
Leucophlegmasia, 209.
Leucorrhœa, 121, &c.
Life, how supported, 26.
Lightning, death from, 43.
Liver, sympathies of, 109, &c.
Liquor sanguinis, 27.
Lobelia, 82, &c.
Logwood, *see* hæmatoxylum), 155.
London Hospital xv.
Lungs, 38, &c.
—— use of, 26.
—— glandular structure, 48.
Lues, 64, &c.

Malaria, 183, 202, &c.
Mania, 169.
Measles, typhoid, 156.
Medicines, to be studied physiologically, distinct from toxicology, 95, *et seq*.
—— dose of, xi.
—— some not understood, ix.
—— fail if in excess, 155.
—— nervous, 175.
—— act less in acute than in chronic disease, or in health, 115, 116.
—— exemplifications, 202.
Membranes, false, *see* " false."
Menorrhagia, 212, &c.
Mercury, 67, 69, 72, 91, 198, &c.
—— action of, 69.
—— and opium, 72.
—— in fever, 140, &c.
Metastasis, 198, &c.
Mezereon, 91, 232, &c.
Miasma, 183, &c.
Microscope, xviii.
Morbid sensibility, viii., 54, 60, 69, 93, 106, 157, *et seq*.
—— poison, 63.
—— sympathetic, 107.
—— from astringents, 124.
Morbid sensibility, from sedatives, 124, 125.
—— without pain, 157.
—— from hæmorrhage, 157.
—— from digitalis, 157.
—— from fright, 157.
—— tetanus, 159.
—— hysteria, 159.
—— epilepsy, 159.
—— shivering, 159.
—— convulsive actions, 159.
—— mental excitement, 159.
—— laughing, 159.
—— sobbing, 159.
—— cramps from diarrhœa, 160.
—— distinguished from fever, 160, 174.
—— pain, 162.
—— from inanition, 163.
—— delirium, 163.
—— from sedatives, 163.
—— after parturition, 168.
—— contrasted with inflammation, 169.
—— —— fever, 161, 174, 178.
—— treatment, 171, &c.
—— hysterical, 171.
Mortification, 57, 123, &c.
Morphia, 86, &c.
—— sedative, 103.
Moxa, 123.
Mucous membrane, 29, 55, 99.
Muscular action, 113.
Narcotics, 80, 98, &c.
—— not stimulant, 80.
—— not sedative, 80.
—— in midwifery, 94.
Nature, a guide, 52, &c.
Neuralgia, 91, 92, 157, &c.
—— morbid sensibility, 157.
—— gout begins with, 261.
—— of brain, 173.
—— treatment, 174, &c.
—— of heart, 174, &c.
Neuritis, 64, 72.
Neuroses, 156; *et seq*.
—— nervous centres irritated, 28.
—— without pain, 158.
—— " irritation," 158.
—— club-foot, curable, 159.

Neuroses, club-foot, causes, 159.
—— tetanus, 159.
—— contrasted with fever, 161, 175, 178, &c.
—— contrasted with fevers, 161, 175, 178, &c.
—— contrasted with fevers, 160.
—— treatment, 161, &c.
—— convulsions, 162
—— delirium tremens, 163.
Nerves, xviii, 35, &c.
—— electricity of, viii.
—— uses of, 35.
—— description of, 35.
—— individuality of, 35.
—— ganglionic, 36, 110.
—— voluntary, 36.
—— involuntary, 36.
—— influence animal heat, 38.
—— dependent on arteries, 44.
—— —— in secretion, 44.
—— —— exhalation, 44.
—— in sores, 53, 54.
—— inflamed, 55.
—— sympathetic, 110.
Nervous influence, 36, 39, 72, &c.
—— generated, 36.
—— analogy with electricity, 36.
—— actions, 72.
Nervous indulgence, 73.
Nervousness, 78, &c.
Nervous centres, 55.
Nightmare, 77.
Nitrate of silver, 39, 87, &c.
Nodes, 66.
Nutrition, general, 26.
—— of parts, 27.

Oil, cod-liver, 206.
Ol. terebinth., 122, &c.
Opiates, 85, 98, &c.
—— antiphlogistic, 86.
—— when heating, 89.
—— in midwifery, 94.
Opium, 72, 85, 103, 200, &c.
—— tincture, 86.
—— liquor sedativus, 86.
—— with mercury, 94.
—— in treatment of ulcers, 94.
—— "eating," 103, &c.
Opium, opposite action on intestines, 169.
Organic action, diminished in inflammation, 46.
Ossific deposition, 66.

Pain, 36, 55, &c.
—— danger from, alone, 162.
Paralysis, 175, &c.
—— confounded with rheumatism, 176.
—— —— with neuralgia, 186.
—— temporary, 176.
—— agitans, 179.
Pathology, 25.
—— veterinarian, xviii.
—— neuro-pathology, 177.
—— humoralism, 177.
Pepper, 121.
Periosteum, 66.
—— inflamed, 66.
Periostitis, 66, 93.
Peripneumony, 144, &c.
—— resembling typhus, 145.
Peritonitis, 56, 202.
—— case, 59.
Perspiration insensible, 29.
—— use of, 38.
Perspiration, promoted by cold, 50.
Phagedenic, 57.
Phlegmonous, 124, &c.
Phosphorus, 76.
Phthisis, 220, &c.
Physiology, definition, 25.
Pit of small-pox, 61.
Plague, 137, &c.
Plastic exudations, 62, &c.
Pleasure, 73.
Plethora, 67, &c.
Pleuritic inflammation, 60.
Pleurisy, 59, 69, 202.
—— case, 59.
—— traumatic, 69.
Poison, morbid, 63, 64, &c.
—— variolous, 64.
—— of insects, 64.
Poisons, 88, 137, 162, &c.
—— remedies, 162.
Poultice, 53.

Pressure, 67.
—— and support, 53.
Primæ viæ, what, 26.
Proud flesh, 53.
—— granulations, how checked, 53.
Ptyalism, 71, &c.
Puerperal state, 117, &c.
Pulse, 39, 76, 124, 180, &c.
—— in inflammation, 40, 41.
—— how to lower, 41.
—— hard, 105.
—— raised by bleeding, 144.
Purgatives, sedative, 79.
—— deceptive phenomena, 205.
—— in puerperal cases, 117.
—— in hysteria, 117.
—— taken unnecessarily, 118.
—— tonics remove necessity for, 112.
—— stimulants, 118.
—— griping from, 115.
—— languor from, 116.
—— morbid sensibility, 116.
—— Hamilton on, 116.
Purpura hæmorrhagica, 211.
Pus, 52.
Pus, uses of, 52.
—— healthy, 52.
—— without breach of surface, 55.
—— a secretion, 58.
—— cells, 58, *note*.
Pustule of smull-pox, 61.
Pyrexia, 127, &c.
—— contrasted with fever, 152.

Quinine, 97, &c.

Rasori, 96.
Remedies pushed too far, 44, &c.
—— becoming noxious, 72.
—— division of, 74.
—— exemplification, 202.
Reparatory process, 39, 54, 55, 59, 60, 122, &c.
Resolution, 66, 101, &c.
Rheumatism, 70, 71, 74, 91, 197, &c
—— dependence on nerves, 39.
Rheumatism, causes, 200.
Ribs, fractured, 60, 69.
Rigor, 122, &c.
Rubefacients, 112, &c.
Rupia, 63.

Salines, 141.
Sarsaparilla, 232.
Savine, 61, &c.
Scab, use of, 53.
Scald, 43.
Scald-head, 230.
Scarlatina, 150, &c.
—— typhoid, 155.
—— without rash, 156.
Schneiderian discharge, 55.
Scrofula, 206, &c.
Secretion, 29, &c.
—— dependent on nerves, 44.
—— diminished, 46, 49.
—— apparatus of, 47.
Secretions, 27, 28.
—— remedies, 45.
—— diminished, 49.
—— how increased, 50.
Sedative medicine, 102, &c.
Sedatives, 76, 77, 79-98, 125, &c.
—— effect on pulse, 76, 77.
—— effects on heart, 77, 78, &c.
—— —— nerves, 78, &c.
—— —— brain, 78, &c.
—— miscalled stimulants, 79.
—— miscalled purgatives, 79.
—— preventing sleep, 80.
—— promoting sleep, 80.
—— not narcotic, 80.
—— produce delirium, 80.
—— act on brain, 80.
—— act on heart, 80.
—— raising pulse, 96, &c.
—— spasm from, 125.
Senega, 213, &c.
Sensibility, animal, of Bichat, 36.
—— organic, 36.
—— morbid, viii., 54, 60, 115.
—— —— how communicated, 108, 111, &c.
Sensual indulgence, 73.
Separation of dead parts, 60.
Serous membranes, 29, 54, &c.

Serous cavities, 29.
—— adhesions, 54.
Shingles, 123, &c.
Shiverings, 122, &c.
Silver, oxide of, 97.
—— nitrate, 39, 87, &c.
Skin, dark colour in fevers, 38.
—— —— in cholera, 38.
Skull, growth of, 30.
Sleep, 72, 79, 103, &c.
—— retarded, 78.
Sleeplessness, 79, &c.
Slough, 56, 57, 124.
—— separation of, 56.
—— of œsophagus, 57.
Sloughs, 58.
Small-pox, 137.
—— vesicle, 61.
—— seams, 61.
—— with slight rash, 156.
Snuff, 79.
Soul, 37.
Spasm of intestines, 126.
Sphacelus, 57.
Specifics, 72, 73, &c.
Spinal cord, 35.
Spirits, 118, &c.
Spleen, physiology of, 46.
Squill, 117, &c.
Sterility, 220, &c.
Stethoscope, xv.
Stimulants, 74, 114, 213, &c.
—— sensorium, 74.
—— action on heart, 74.
—— in excess, 74, 75.
—— oppression from, 75.
—— lungs, 75.
—— glands, 75.
—— skin, 75.
—— digestion, 75.
—— diffusible, 77, 121, &c.
—— sympathetic, 76.
—— local, 76, 125, &c.
—— promoting sleep, 79.
—— disturbing sleep, 79.
—— depression from, 96, &c
—— local relaxants, 112.
—— hypnotic, 203, &c.
—— antiphlogistic, 203, &c.
Stimulants increasing action not power, 139.
Stramonium, 82, &c.
Strapping, 53.
Study, 74.
Struma, 204, &c.
Support, 67.
—— not pressure, 53.
Suppuration, 58, &c.
Surgery assisted by medicine, 52.
Swelling, 61.
—— removal of, 61, &c.
Sympathetic pains. 107.
———— how communicated, 108.
—— contractions, involuntary, 108.
Synocha, 128.
—— symptomatic, 127.
—— petechialis, 128.
Synochus, 130.
Sympathies, morbid, 111.
—— uterine, 112.
—— spinal cord, 112.
Syphilis, 49, 91, &c.
Syphilitic eruption, 63.

Tadpole, development illustrates determination, 45.
Taliacotian operation, 51.
Tartar emetic to allay sickness, 94.
Tea, 76, 78, 79, 114.
—— green, 25, 78.
Teeth, 29, &c.
—— membranes of, 66.
Temperature, 38.
Tetanus, 161, 166.
Thoughts, 73.
Tic doloureux, 72, &c.
Tissue, disorganisation of, 42, &c.
Tobacco, 78, 82, &c.
"Tolerance," in disease, 115.
—— in health, 116.
Tongue, 172, &c.
Tonics, 74, 87 to 98, &c.
—— not stimulant, 87, &c.
—— when sedative, 87, &c.
—— modus operandi, 87.

Tonics, morbid sensibility from, 87.
—— stimulants act as, 88.
—— in inflammation, 90, 91.
—— act slowly, 90.
—— in excess, 91, &c.
—— astringency of, 92.
—— narcotics act as, 93, &c.
—— selection of, 96.
—— in paralysis, 175.
—— deceptive phenomena, 203, &c.
Toothache, 66, &c.
Trismus nascentium, 167.
Tubercles in lungs, 220, *et seq.*
Tumours, how formed, 65, &c.
—— cancerous, 66.
—— indolent, 66, 67.
—— fatty, 66.
—— ossific, 66.
—— vascular, 66.
—— strumous, 66.
—— constitutional, 66.
—— absorption of, 67.
—— remedies for, 67.
Turpentine, 54, 122, 213.
Typhus, meaning of, 130.
Typhoid, 130, &c.

Ulcer not inflammation, 57.
Ulceration, 57, 60, &c.
—— renewed, 57.
Ulcerative inflammation, 57.
Ulcers, 39, 53.
Ulcers, treatment, 53, 54.
Ulcus, 57.
Urethra, 55.
Urine, 73, 74, 114, &c.
Union by "first intention," 51.
—— granulations, 52.
Uterus, lining of gravid, 56.
Uva ursi, 115, &c.

Vaccine vesicle, 62.
Variola, 62.
Vascular action, xiv., 30, 39, &c.
Venesection, 68, &c.
Veratria, 200.
Vertigo, 77, &c.
Vesication, 39, &c.
Veterinarian pathology, xviii.
Vinegar to ulcers, 53.
"Vis medicatrix naturæ," 51, &c.
Vis a tergo, 71, 102, &c.
"Vital laws," 20.
—— powers sunk, 38, &c.
Volition, 35.
—— velocity of, 35.
Voluntary motion, 72.

Wakefulness, 78, &c.
Warmth, 73.
Ward's paste, 121.
Warts, 61, &c.
Water-dressing, 53.
Whooping-cough, 213, 143.!
Wines, 118, &c.

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CONTENTS OF THE

AMERICAN JOURNAL OF THE MEDICAL SCIENCES. April, 1851.

ORIGINAL COMMUNICATIONS.

MEMOIRS AND CASES. pp. 235–391.

Art. I. Warren's Account of two Indian Dwarfs exhibited under the name of Aztec Children. (With two plates.) II. Watson's Cases of Gunshot Wound in Left Axilla—Ligature of Left Subclavian, and subsequent Ligatures of Brachial and Subscapular Arteries. III. Bacon's Observations on the Dumb-Bell Urinary Deposit. IV. Parsons on some of the Remote Effects of Injuries of Nerves. V. Morland's Extracts from the Records of the Boston Society for Medical Improvement. VI. Johnston's Remarkable Obstetrical Cases. (With a wood-cut.) VII. Jackson on Hot Water in Sprains. VIII. Kneeland's Report on Idiotic Crania, Idiocy, and Cretinism. IX. Adams' Case of Hæmoptysis Neonatorum. X. Dalton on a new form of Phosphate of Lime in Crystals; as it occurs in Putrefying Urine. (With seven wood-cuts.) XI. Peaslee's Case of Double Ovarian Dropsy—both Ovaries successfully removed by the large Peritoneal Section. XII. McIlvaine's Cases in Surgical Practice.

REVIEWS. pp. 391–417.

XIII. Report of the Sanitary Commission of Massachusetts. XIV. Musée d'Anatomie de la Faculté de Médecine de Strasbourg—Histoire des Polypes du Larynx. Par C. H. Ehrmann.

BIBLIOGRAPHICAL NOTICES. pp. 417–450.

XV. Beck's Elements of Medical Jurisprudence. Taylor's Medical Jurisprudence. XVI. Sutton's History of Typhoid Fever. XVII. Ricord's Illustrations of Syphilitic Disease. XVIII. Nunnely on Anæsthesia and Anæsthetic Substances generally. XIX. Fosgate on Sleep Psychologically considered with reference to Sensation and Memory. XX. Webster's Notes on a Recent Visit to several Provincial Asylums for the Insane in France. XXI. Bond's Practical Treatise on Dental Medicine. XXII. Warren's Address before the American Medical Association, in Cincinnati, May 8th, 1850. XXIII. Dunglison on New Remedies, with Formulæ for their Administration. XXIV. Tilt on Diseases of Menstruation. XXV. Billing's First Principles of Medicine. Second American edition. XXVI. Murphy's Review of Chemistry for Students. XXVII. The Uses and Abuses of Air. XXVIII. Yeoman on Consumption of the Lungs. XXIX. An Appeal to the public in behalf of a Hospital for Sick Children.

QUARTERLY SUMMARY.

FOREIGN INTELLIGENCE.

ANATOMY AND PHYSIOLOGY. pp. 451–457.

1. *Peacock* on the Weight of the Brain at different periods of life. 2. *Coulson* on the Anatomy of the Subcutaneous Bursæ 3. *Rainey* on the Round Ligament of the Uterus. 4. *Hancock* on New Muscles of the Urethra. 5. *Robertson* on Fistula of Stomach. 6. *Toynbee's* Researches to prove the Nonvascularity of certain Animal Tissues. 7. *Bernard* on the Absorption of Alimentary Substances, and the Functions of the Lacteals.

MATERIA MEDICA AND PHARMACY. pp. 458–462.

8. *Bagot* on Evil Effects following the Incautious Administration of Chloroform. 9. *Flourens* on the Effects of Chlorinated Hydrochloric Ether on Animals. 10. *Snow* on the Inhalation of various Medicinal Substances. 11. *Routh* on the Physiological Effects of Picrotoxine, or the Active Principle of Cocculus Indicus. 12. *Dorvault* on Iodognosis. 13. *Routh* on New Preparation of Phosphate of Iron.

MEDICAL PATHOLOGY AND THERAPEUTICS AND PRACTICAL MEDICINE. pp. 462–491.

14. *Ancell* on Tubercle and Tuberculosis. 15. *Van der Kolk* on Elastic Fibres in the Sputa of Phthisis. 16. *Redfern* on Fibre in the Structure of Cancer. 17. *Johnson* on Chemical and Microscopical Examination of the Urine in Renal Diseases. 18. *Johnson's* Cases of Renal Disease. 19. *Johnson's* Diagnosis of Fatty Degeneration of Kidney. 20. *Namias* on Atrophy of the Spinal Marrow. 21. *Knox* on Vaccination as a Preventive of Small-pox. 22. *Craninx* on Vaccination and Revaccination. 23. Results of Revaccination in the Prussian Army during 1849. 24. *Aran* on Abortive Treatment of Variola with Collodion. 25. *Roger* on Combination of Auscultation and Percussion. 26. *Trousseau and Lasègue* on Auscultation in the Pneumonia of Infants. 27. *Simpson* on Local Paralysis in Infancy. 28. *Helfft* on Recent Epidemic of Scarlatina at Berlin. 29. *Boudin* on Cretinism. 30. Causes and Cure of Goitre. 31. *Aran* on Chloroform in Lead Colic. 32. *Bazin and Bourguignon* on the Treatment of Itch. 33. *Trousseau* on Disease of the Heart and Chorea. 34. Sulphate of Zinc in Chorea. 35. *Chambers* on the Treatment of Obesity.

SURGICAL PATHOLOGY AND THERAPEUTICS AND OPERATIVE SURGERY. pp. 491–516.

36. *Hewett's* Case illustrating the Difficulties of Diagnosis of Morbid Growths from the Upper Jaw. 37. *Skey* on the Results of the use of Chloroform in 9000 cases at St. Bartholomew's Hospital. 38. *Coulson* on the Pathology and Treatment of enlarged Subcutaneous Bursæ. 39. *Lloyd's* Treatment of certain cases of Hare-lip. 40. *Walton* on Excision of the Head of the Femur. 41. *Norman's* Case of Ovariotomy; Spontaneous Disappearance of Ovarian Tumours. 42. *Taylor's* Case of Tumour for which the Operation of Ovariotomy was attempted more than twenty-five years ago, with Dissection. 43. *Smyly* on Femoral Aneurism cured by Compression. 44. *Wakley's* New Instruments for the Cure of Stricture. 45. *Stark* on Rupture of the Crucial Ligament of the Knee-joint. 46. Cotton Wadding as an Application to Bed-Sores and Varicose Ulcers.

OPHTHALMOLOGY. pp. 516–519.

47. *Jacob* on Preparatory and After-treatment in Cataract Operations.

MIDWIFERY. pp. 519–524.

48. *Gray's* Case of Protrusion of the Hand of the Child through the Walls of the Vagina and Rectum in a case of Head Presentation. 49. *Thatcher* on Central Laceration of the Perineum. 50. *West's* Case of Cæsarian Section, with Remarks on the Danger of the Operation. 51. *Oldham's* Case of Cæsarian Section. 52. *Lee* on the Cæsarian Section and Premature Labour. 53. *Lagae* on Injury of the Cranium and Wound of the Brain in a New-born Child—Recovery. 54. Quintuple Birth. 55. *Farrage* on Polypous Excresences from Umbilicus in New-born Children.

MEDICAL JURISPRUDENCE AND TOXICOLOGY. pp. 224–530.

56. Identity. 57. Abortion. 58. Ancient Trial for Impotence. 59. Absence of Milk after Delivery. 60. Present Law of Virginia concerning Abortion. 61. Legal Definition of what constitutes a Wound. 62. Procuring Abortion, or Premature Birth. 63. Poisoning with Cocculus Indicus. 64 *Chevalier* on the Diseases of Manufacturers of Sulphate of Quinine. 65. *Pelouse and Bernard* on Curare. 66. *Salisbury's* Case of Abortion by Savin.

AMERICAN INTELLIGENCE.

ORIGINAL COMMUNICATIONS. pp. 531–534.

Wills Hospital—Service of Dr. Isaac Hays—Cases discharged from Oct. 1st, 1850, to Jan. 1, 1851. By A. F. Macintyre, M. D. *Gardette* on Lectureship on Dental Surgery in Medical Colleges.

DOMESTIC SUMMARY. pp 535–544.

Church on Femoral Aneurism cured by Compression. *Lente* on Coup de Soleil, or Sun Stroke. *Jeter's* Case of Cæsarian Section. *Campbell* on Striped and Unstriped Muscular Fibre. *Cooke's* Antilithic Paste. *Wright* on the Vapour of Water in an Overdose of Opium. Refracture of a Leg to Improve Defective Surgery. *Ready* on Aphonia and Obstinate Cough from Prolongation of the Uvula. *Lindsly's* two Cases of Mumps, with Metastasis to the Brain, both terminating fatally. *Dugas* on Dislocation of the Radius and Ulna backwards at the Elbow. An Act to Promote Medical Inquiry and Instruction. By Mr. Tuthill. American Medical Association.

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Plates 5 and 6.—Surgical Form of the Deep Cervical and Facial Regions, and Relative Positions of the principal Blood-vessels, Nerves, &c.

Plates 7 and 8.—Surgical Dissection of the Subclavian and Carotid Regions, and Relative Anatomy of their Contents.

Plates 9 and 10.—Surgical Dissection of the Sterno-Clavicular or Tracheal Region, and Relative Position of its main Blood-vessels, Nerves, &c.

Plates 11 and 12.—Surgical Dissection of the Axillary and Brachial Regions, displaying the Relative Order of their contained parts.

Plates 13 and 14.—Surgical Form of the Male and Female Axillæ compared.

Plates 15 and 16.—Surgical Dissection of the Bend of the Elbow and the Forearm, showing the Relative Position of the Arteries, Veins, Nerves, &c.

Plates 17, 18 and 19.—Surgical Dissections of the Wrist and Hand.

Plates 20 and 21.—Relative Position of the Cranial, Nasal, Oral, and Pharyngeal Cavities, &c.

Plate 22.—Relative Position of the Superficial Organs of the Thorax and Abdomen.

Plate 23.—Relative Position of the Deeper Organs of the Thorax and those of the Abdomen.

Plate 24.—Relations of the Principal Blood-vessels to the Viscera of the Thoracico-Abdominal Cavity.

Plate 25.—Relations of the Principal Blood-vessels of the Thorax and Abdomen to the Osseous Skeleton, &c.

Plate 26.—Relation of the Internal Parts to the External Surface of the Body.

Plate 27.—Surgical Dissection of the Principal Blood-vessels, &c., of the Inguino-Femoral Region.

Plates 28 and 29.—Surgical Dissection of the First, Second, Third, and Fourth Layers of the Inguinal Region, in connection with those of the Thigh.

Plates 30 and 31.—The Surgical Dissection of the Fifth, Sixth, Seventh and Eighth Layers of the Inguinal Region, and their connection with those of the Thigh.

Plates 32, 33 and 34.—The Dissection of the Oblique or External and the Direct or Internal Inguinal Hernia.

Plates 35, 36, 37 and 38.—The Distinctive Diagnosis between External and Internal Inguinal Hernia, the Taxis, the Seat of Stricture, and the Operation.

Plates 39 and 40.—Demonstrations of the Nature of Congenital and Infantile Inguinal Hernia, and of Hydrocele.

Plates 41 and 42.—Demonstrations of the Origin and Progress of Inguinal Hernia in general.

Plates 43 and 44.—The Dissection of Femoral Hernia, and the Seat of Stricture.

Plates 45 and 46.—Demonstrations of the Origin and Progress of Femoral Hernia, its Diagnosis, the Taxis, and the Operation.

Plate 47.—The Surgical Dissection of the principal Blood-vessels and Nerves of the Iliac and Femoral Regions.

Plates 48 and 49.—The Relative Anatomy of the Male Pelvic Organs.

Plates 50 and 51.—The Surgical Dissection of the Superficial Structures of the Male Perineum.

Plates 52 and 53.—The Surgical Dissection of the Deep Structures of the Male Perineum.—The Lateral Operation of Lithotomy.

MACLISE'S SURGICAL ANATOMY—(Continued.)

Plates 54, 55 and 56.—The Surgical Dissection of the Male Bladder and Urethra.—Lateral and Bilateral Lithotomy compared.

Plates 57 and 58.—Congenital and Pathological Deformities of the Prepuce and Urethra.—Structure and Mechanical Obstructions of the Urethra.

Plates 59 and 60.—The various forms and positions of Strictures and other Obstructions of the Urethra.—False Passages.—Enlargements and Deformities of the Prostate.

Plates 61 and 62.—Deformities of the Prostate.—Deformities and Obstructions of the Prostatic Urethra.

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